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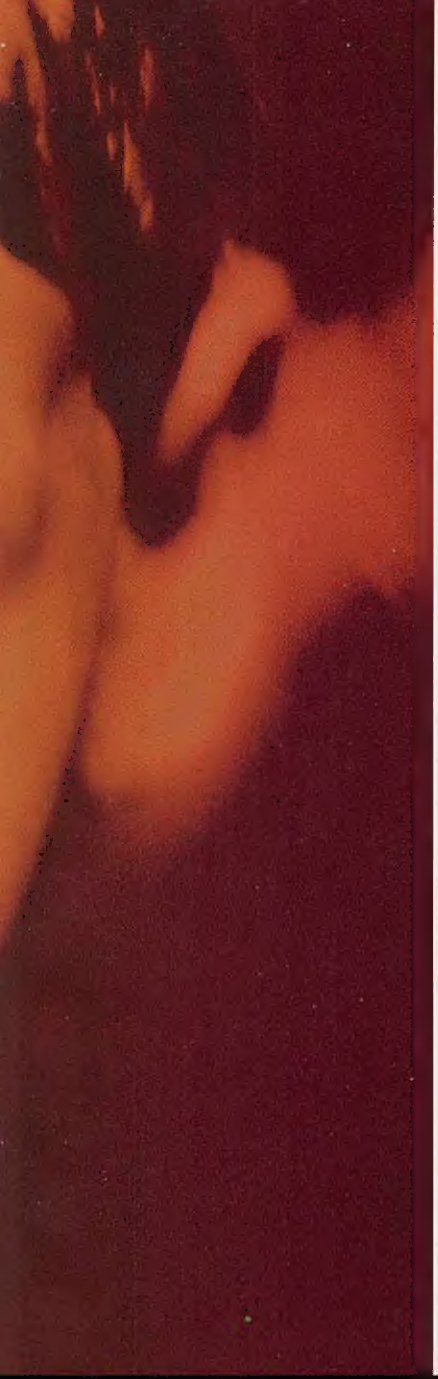

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ED WORD

Perchance to Dream

A year ago, the original *boot* editorial staff gathered around the art director's monitor, reveling in a ripping new magazine cover. From the blackness, a special PC was glowing. It was our first Dream Machine.

God, does that machine feel primitive today.

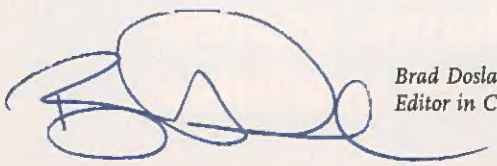
Today, an entirely different editorial staff gathers around a new art director's monitor. We are proudly admiring a new black cover sporting a very special PC—a PC that glows with the Pure PC Power that *boot* was founded to serve. Dream Machine 97 is what it's all about. A relatively attainable machine that kicks the ass of any and all comers.

Its spec sheet alone will make any aficionado break out in a swerve drool. 300MHz of Pentium II love pumping through a 64MB DIMM beats down benchmarks like nobody's business. And there's a spare SEC slot waiting to slap any workstations that wanna rumble. All this power plugs into your head via a monitor and speakers that are as sharp as the cutting edge gets.

This new-and-improved Dream Machine is rife with hard-fought details, such as disc editor Sean Cleveland's battle to keep the ISA bus barren. This squeezed another 10 percent speed increase out of the system. There was also hardware editor Andrew Sanchez' dramatic last-minute decision to pull Cambridge's PC Works in lieu of Altec Lansing's latest. And software editor Sean Downey opted for the Iomega's Zip drive over the LS-120 (ne SuperDrive) despite furious debate. Tech editor Chris Dunphy pushed his dual-video card agenda through by conceding DVD-RAM wasn't practical... yet. Actually, everyone struggled over the DVD vs. CD-ROM dilemma. Sorry, DVD. Maybe next year.

The new and improved *boot* team made this work of art possible. Its relentless drive and frightening knowledge of all things PC make the Dream Machine—and *boot* magazine—what it is today: a well-oiled machine capable of changing the computer industry.

Thanks to you, the *boot* reader, for all your passion and support. Stick around, Dream Machine '98 will devastate you!



Brad Dosland
Editor in Chief

NEWS

15 bootWire ***News*** *that* ***matters.*** *It's a buyer's market as prices* ***plummet*** *(again) for all the* ***best*** *CPUs.* ***Overstocked*** *RAM inventories mean lower* ***prices*** *for you. ALSO: It's not easy being* ***number one.*** *Just ask Compaq. The PC giant is facing a* ***massive*** *class-action suit that charges the company with* ***misleading*** *buyers, selling* ***faulty*** *products, and* ***bilking*** *customers with* ***pay-per-play*** *customer service. PLUS: Are we* ***witnessing*** *the* ***last*** *days of Apple's once-promising Macintosh platform? Recent events paint a* ***grim*** *picture for the* ***ailing*** *company.*

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33 The Saint *Columnist* ***Alex St. John*** *debuts with a timely how-to guide for getting* ***fired*** *from Microsoft.*

128 Glitch *Columnist* ***Jon Phillips*** *paints a* ***daunting*** *scenario for prospective* boot *editors.*

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12 bootDisc *A guide to the* ***joys*** *of our shiny silver platter, including:* X-Com: Apocalypse, Twinsen's Odyssey, Rebirth, Adobe After Effects 3.1, HyperWire.

15 bootNet *It's* ***the*** *place to* ***be*** *online for Pure* ***PC*** *Power.*

22 Pure Lust *Tech toys for* ***digital*** *girls and boys.*

54 12-Step Program and Clinic *Everyone else has one up and running;* ***why*** *don't you?* ***Share*** *your most* ***intimate*** *moments with the* ***entire*** *world. This month's 12-Step shows you how to* ***rig*** *your own web cam.* ***Smile!***

62 White Paper: Auio File *From corner loading to cross-over, this month's White Paper is dropping* ***serious*** *audio* ***knowledge*** *your way and putting the bandpass back in your enclosure.*

66 bootWorthy: Scanners *Taking* ***images*** *from the analog world you currently live in to the* ***digital*** *world you* ***wish*** *you lived in is a job for* ***flatbed*** *scanners. These are the ones we would* ***buy.***

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P/REVIEWS

70 Previews ***First*** *looks at the products and technologies that will* ***change*** *your world... 'til the next new thang.*

77 Reviews ***All*** *camps are* ***represented*** *this month, with* ***systems*** *based on the P-II, K6, P200 and P233 MMX, a mobile P166 MMX... and even a Pentium 75 checking in. Littered among this* ***carnage*** *are treasures such as:*

- *The* ***first 10 verdict*** *we've* ***ever*** *given a system.*
- *A summary of the* ***best speakers*** *we've ever heard.*
- *Adobe's* ***much-awaited*** *After Effects for the PC.*
- *A* ***showdown*** *between living legends: Matrox and Number Nine's* ***newest*** *3D Cards.*

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Our Dream Machine is the essence of the ***Pure PC Power*** *that* boot *is built upon. Our editors have created a* ***hand-built*** *system that outperforms any other PC available.*

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52 *Phone*-Line *Fragfests*

Online gaming is unfurling in ***every*** *direction and there's no* ***better*** *time to separate the* ***killer*** *services from the* ***crappy*** *ones, and give you the* ***straight*** *poop you need to* ***quickly*** *begin a-dogfightin' and a-fraggin' and a-scrabblin'. Don't have the client* ***software****? No prob. Simply launch this month's* ***bootDisc****.*

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Product Information Number 87

boot

september 1997

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720 Post Road, Scarsdale, NY 10583

volume 2, issue 9

boot *(ISSN 1088-5439) is published monthly by Imagine Publishing, Inc., 150 North Hill Drive, Suite 40, Brisbane, CA 94005, USA. Periodical class postage paid in Brisbane, CA and at additional mailing offices. Newsstand distribution is handled by Curtis Circulation Company. Basic subscription rates: one year (12 issues) U.S.* ***$39.90****/Canada* ***$53.90*** *Canadian price includes postage and GST (GST #128220688).* ***POSTMASTER*** *Send changes of address to* **boot**, *P.O.Box 51479, Boulder, CO 80328-1479.*

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Imagine Publishing also publishes PC Gamer, Next Generation, Mac Addict, Ultra Game Players, PlayStation Magazine, *and* The Net.

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How Long Before It's Too Old?

I recently moved up from a 486-100MHz system to an AMD K5 PR166 with a shuttle HOT-557 motherboard and an Acer PCI video card powered by a S3 ViRGE chip. I am not a rich man and it took me five weeks to save up for this upgrade. Shortly after my purchase the K6 comes out. MMX chips are everywhere. Klamath koneth. How long will my "plain vanilla" system last before it's upgrade time? Are "plain vanilla" Pentiums soon to be residents of Jurassic Park?

Paul Zaborny

Hardware editor Andrew Sanchez replies: *Plain-vanilla Pentiums are hitting the fast road toward extinction. At Intel's rate of price dropping, it will be almost impossible to find non-MMX CPU-based systems(unless some OEM still has them in its channel and is blowing them out at some ridiculously low price). Most major vendors are going with an all-MMX system line-up by year's end. As for upgrading to MMX... You should do so as soon as you fall head-over-heals in love with an application that absolutely requires MMX.*

3D Watermelons

I read your article about the 19 new 3D cards (*boot* 11) and I'd love to see an article about the 3D-compatibly issue. It appears to be useless to buy a 3D card unless you can afford to buy a new one every three months, until there is some sort of standard! (OpenGL, hopefully.) Comparing 3D cards is like comparing peanuts to watermelons. Right now a game company has to write different versions to support all the 3D video cards, i.e., *MechWarrior 2*. I doubt that many companies will have the time or money to do this and will only make one for their favorite 3D card. So there are going to be lots of really cool games that you can't play no matter what card you have.

You guys have had a chance to play with all the latest 3D cards. Tell me, is that a fair analysis of the situation? Is there a standard in sight? Will it be OpenGL?

Dennis Zeitz

Tech editor Chris Dunphy replies: *Agreed. Compatibility issues have been a thorn in the side of 3D accelerated gaming, thanks in large part to the broken design of Direct3D. But the first year's worth of growing pains have finally begun to shake out the problems in Direct3D, and, hopefully, compatibility issues will start to fade. Also, as hardware becomes more capable, there's less need for games to try and support the limited feature sets of old-style 3D decelerators. It can only get better from here.*

In the meantime, your best bet for maximum compatibility is to go with 3Dfx. It has achieved a leading position in the 3D wars, and I doubt there will be many 3D games that are released that have not been thoroughly tested on it. The Rendition Vérité probably has the second most support in the industry and is also a good bet.

OpenGL is a good API, but it will not be in a position to replace Direct3D any time soon. They will likely coexist—this is a good thing. The more choices of API, the better. (Except from the point of view of the poor sap who has to write drivers for the damn things!)

Re-inventing the Wheel

It seems Microsoft is telling us, "We've invented a new wheel (Direct3D), it's square and chipped out of stone, and we know about steel-belted radials (OpenGL). But we're going to force everyone to use ours because we want to be in control!" It doesn't matter that OpenGL is proven to accelerate 3D far better than Direct3D ever will. Don't forget who once said, "Who could possibly need more than 640K of RAM?" That was a very short-sighted comment that we are still paying for. We can't allow them to force us into another bad situation that will affect things for years to come. The 3D revolution is just getting started, let's do it right! Death to Direct3D! Long live OpenGL!

Dennis Zeitz

*"The 3D **revolution** is **just** getting **started**, let's do it **right!** **Death** to **Direct3D**! Long **live** OpenGL!"*

Columnist Alex St. John replies: *Microsoft is already in control, whether they ship OpenGL or Direct3D. It feels no competitive threat from OpenGL whatsoever. There's no significant victory to be had for anybody by Microsoft supporting OpenGL. The only "feature" of OpenGL you're not going to get in Microsoft's 3D API is the name. The primary reason that Microsoft merged the Direct3D team with the OpenGL team was because trying to have two parallel 3D APIs and driver architectures was too confusing for everyone to handle and caused a great deal of internal, as well as external, strife.*

The other major reason is that multimedia driver problems make up 60 to 80 percent of nearly all support calls. When a game blows, it's almost always because of a driver problem... and that's just for simple 2D video drivers and joystick stuff. Imagine what it's like for 3D drivers that are 10 times as complicated to build! Do you want everyone to have to try to write two or even three of them and make them all work reliably? No way.

Microsoft has no animosity toward OpenGL. It would have been Direct3D on Win95 way back when, had differences in priority between the Win95 and NT groups been resolved. Direct3D is just a marketing name, like DirectInput is just a marketing name for JoyGetPosEx, it doesn't mean anything. Microsoft wants to give developers the

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functionality they want, they're just too screwed up sometimes to get it together enough to listen.

Last point, it's the same guys who make Direct3D who would be making OpenGL if that's the direction they'd taken. Do you really think the change in name would have made the actual technology a lot better?

Mister Robinson's Neighborhood

While most of Fast Forward in *boot* 10 is interesting, I find fault with it for not pointing out a major downfall of broadband: Many ISPs still have T1 connections. What happens when all their users have just as much, or even more bandwidth? Sure, ISPs will upgrade, but can the Internet really handle 20 million people sucking down 9Mbps? Upgrade, upgrade, you say. But there's a limit. I suspect we will never get 9Mbps per user as long as all data is routed over backbones. Now if we had a true network, where everybody helped carry the data load passing through their area....

Alan Robinson

Executive editor Jon Phillips replies: *By the time broadband is truly broad (three to five years at the earliest), competition will force all ISPs to pay for T3 (45Mbps) backbone access. Since the largest backbones are upgrading all the way up to 622Mbps, they'll be more than ready to support cable and DSL solutions.* boot*'s Telco friends are quick to point out that slow servers, not backbones, are the bottleneck scourges of the Internet.*

Why exactly would you want to do everything within your browser? Power users can deal with starting an FTP program to download files, especially if the program offers useful features such as downloading entire directory trees or resumption of broken downloads. I don't spend all day on the net, and I look toward the encroaching browser-as-desktop way of life with horror.

The latest version of Win95 requires that you install *Internet Explorer*. It is *not* optional. What if I don't have an Internet connection? What if I don't want *IE*? If Win98 just becomes a browserfied Win95, you can bet that I, for one, will not be buying it.

Alan Robinson

Executive editor Jon Phillips replies: *Microsoft is betting a lot of fumbling newbies will embrace the new browser-style system navigation in Windows 98—it's apparently more intuitive than Xerox PARC's original folder paradigm, which we see today in the Macintosh and Windows OSes. While you will indeed be forced to install* Internet Explorer *(you already have to in Win95), the ominous browser/desktop shell will be optional. For the record, the browser was always intended to be a megaclient app that offered HTTP, FTP, e-mail, and Telnet via a single interface. Likewise, hypertext was never intended to be web-specific. It's a universal model for information retrieval, and it could well have been Windows' original model in an alternative universe.*

Cache and Carry

When will manufactures start making motherboards that address more than 512K of onboard cache? I heard that Intel's Klamath could access up to 1MB of cache. Is this true? I saw motherboards back in December of 1996 that support up to 4MB of 12ns cache and processor speeds of up to 266MHz. All this when Intel, AMD, and Cyrix were only dreaming of motherboards so capable. In my eyes, Intel is going to lose all its customers to new-and-better processor companies by the year 2000. When Intel brings out its new Pentium II with MMX running at the same CPU speed or maybe a little faster, other companies are coming out with CPUs doing 500MHz. If Intel wants to keep up in the race it will have to release its new CPUs all at once and offer a variety to choose from.

Intel is very stable right now, but when other companies are going to be releaseing 700MHz to 800MHz, Intel will only be putting out their 500MHz, 533MHz, and 566MHz systems. Intel needs to plan, because people aren't going to wait around for something that's already out and ready to roar.

Michael

Hardware editor Andrew Sanchez replies: *There are three reasons why many motherboard manufacturers haven't gone past the 512K limit.*

First, Intel's 430VX, HX, and TX practically dominate the Socket 7 motherboard PCIset scene. When the market leader says it's only going to support 512K of L2 cache, there's not much you, as a motherboard manufacturer, are going to say or do. Sure, you can go with alternate PCIsets from ALi, SiS, or VIA, but do they have the infrastructure and technical support to handle millions of boards?

Intel also owns the Pentium Pro/Pentium II motherboard chipset marketplace—so don't even go there!

Second, supporting gobs of L2 cache is very different from actually getting those gobs of cache to work on motherboard systems. Many manufacturers we've spoken to haven't been able to get L2 cache past 512K on an Intel/x86 system, resulting in unreliable behavior and system crashes. Is this something to which you, as a motherboard manufacturer, are willing to commit tech support?

Third, there's an intimate relationship between the amount of L2 cache you have and how much system RAM you have. While the latter depends greatly on operating system, PCIset, and BIOS settings, as a general rule: if you have anywhere from 16MB to 32MB of RAM, 256K should be sufficient for optimal cache performance. If your RAM situation is between 32MB and 128MB of RAM, 512K is good (especially if you're running Win95). Systems pushing 128+MB should have 1MB of L2 cache, while 256+MB of system RAM should have 2MB of L2 cache.

If you're running this much memory and L2 cache, you should be running a true 32-bit OS such as WinNT. As you can see, large L2 cache works best if you have lots *of memory and the right OS.*

Waitin' and Debatin' for Oh So Long

Can you verify the 440LX chipset release date? I've been waiting forever for this. I think AGP is far more important to gamers and graphics types than the addition of MMX to the P-Pro.

Roger Williams

Hardware editor Andrew Sanchez replies: *By the time you read this, the 440LX PCIset will be appearing on a Pentium Pro/Pentium II motherboard near you from all the major vendors, alongside AGP video-card chipsets from ATI, NVidia, and others. Motherboard vendor Tyan has told us that we'll be seeing AGP boards in August, and we're already being accosted by major system manufacturers eager to show off their AGP systems.*

Scared of Windows?

In Tom Riegsecker's letter (*boot* 11), he says that we "power users" say Windows 95 is "complicated, slow, buggy, and resource hungry." This is true. If Tommy can prove me wrong, I'll give him a shiny nickel so he can go buy some more memory. I have a fast computer for one reason, to run my apps as fast as possible. If I have to subtract 100MHz from my Pentium 200 for the OS, then DOS is faster.

Many OSes are faster and better than Win95 and DOS. Linux is a great example. It is unpowerful users such as you, Tom, who keep more OSes being written like this. A good operating system doesn't need to "learn that I always want my windows 200x300 after I do it three times" and it certainly doesn't need to slap all of its devices in the same layer, let them battle it out with eachother, and then hiss at developers for bugs that you could have easily had the OS stamp out.

A couple of other things, Tom: If it wasn't for us "weenies" and "morons" reading *boot* and knowing computers, you'd be running CP/M and you'd like it.

Space Cowboy

33.6 '96 = x2 '97

I just read the letter slamming x2 modems (*boot* 11). A few years ago everybody had the same gripes and snide remarks about 33.6Kbps technology; now you can't even buy a modem below that speed.

When I lived in the middle of town (inside the boundaries of the central switching area for Ameritech) I routinely got 31.2Kbps to 33.6Kbps hookups with my Courier modem. Now that I've moved to the 'burbs, the best I can get is 26.4Kbps. Why? Because I'm in a different switching area, and because of the old local switching unit in the subdivision. The phone company has said that a conditioned line will take care of that, providing a direct connect to the central switching station again—once the box in the subdivision is upgraded. I can wait, and will gladly pay the $2.95 extra a month.

The U.S. Robotics Sportster is the best commercial-grade modem available, and

the Courier's the best professional one available. I am service manager for a VAR, and repair, build, and advise customers on this stuff. A lot of people have an axe to grind with USR for being successful, but I've seen too many of the "other" brands fail right out of the box to ever recommend anything other than USR.

BTW, does the author think things will be any better with Rockwell's K56Flex hardware? Get a grip, dude.

John Hull

Executive editor Jon Phillips replies: *Line conditions aside, neither technology seems to outperform the other. The consumer question really comes down to ISP support, and for now, USR has the upper hand. Both camps are currently launching massive ad campaigns to popularize their modems. Rockwell is even paying for television spots and billboards promoting K56Flex. Strange. A lot of money is being spent to boost brand names that have a shelf life of less than one year. In early 1998 the International Telecommunications Union will ratify a single standard for 56.6Kbps throughput. Rest assured, the standard will be identified by numbers and letters, not a cute branding device that favors any one company. Then the modem war will be over.*

"I **have** a fast **computer** for one **reason**, to **run** my apps as **fast** as **possible**. If I have to **subtract** 100MHz from my **Pentium 200** for the **OS**, then DOS is **faster**."

Loving the Mystique

I am replying to Matrox's rebuttal in *boot* 10. I have to disagree with Jason's assessment of the 3Dfx Voodoo. I tried all the 3D cards a few months ago, except the 3Dfx (due to the high price), but returned most of the cards due to incompatibility or slow performance. I expected to return the Mystique, since I kept reading how inferior it is. Wrong! It was by far the best of the three. It's the fastest in Win95 and in DOS with all my games. We tried the Monster 3D 3Dfx Voodoo.

Boy what a letdown!

It installed like a dream, but it's slower in *Hellbender* and *Monster Truck Madness* than the Mystique! The frame counter stayed around 15 to 25 on the Mystique, and the 3Dfx was around 8 to 22. The colors on the 3Dfx were really washed out too. (Rendition made everything look green). The blurring effects were really annoying. Next we installed *GlQuake*, and were again very disappointed! It was so blurry. I was dying to see the detail in the handsome hairy shambler, but he just faded away and looked like a smooth greaseball!

Heather Walton

Tech editor Chris Dunphy replies: *Heather, you should apply for a job at Matrox, you preach their gospel even better than they do. The Mystique is indeed a darn nice DOS and Windows 2D card, but it is nowhere near the same league as 3Dfx when it comes to 3D acceleration. If you are getting washed out colors (a green tint?!) and slower frame rates with a 3Dfx, then there must be something seriously wrong with your system.*

Blurring effects annoying?

Bilinear-filtered textures don't reduce the amount of information you see, and, in fact, increase the apparent resolution of textures by interpolating and anti-aliasing the texture maps. The only defense Matrox can offer to this is to use higher res texture maps to begin with, which few games do.

As far as I'm aware, only the Mystique-enhanced versions of Moto Racer *and* MechWarrior *do this—and they still don't look as good as on cards that provide filtering.*

The other feature that will really kill the Mystique is its inability to do transparencies. This has not mattered much in the past, but the next batch of ultra-impressive 3D games such as Forsaken *(see the preview on page 74),* Out Of The Void, G Police, *and many others make heavy use of alpha blending to achieve some eye-popping special effects. I will be amazed if these games run at all, much less look good, on Matrox's current generation of 3D hardware.*

As for your obsession with that handsome hairy shambler (a.k.a. Brad Dosland)... Well, I don't even want to go there.

Linux Redux

I disagree with *boot*'s constant preaching of the wonders of NT.

NT is a kludge, just not as much as Win95. The eventual unification of Win95 and WinNT will move computing along, but we'll still be running a generally bad OS. A good alternative, for those who don't want to shell out a couple hundred extra bucks for NT, is Linux.

Pros of Linux: 1.) It's free. 2.) It's stable. 3.) It runs on any x86 system, 386sx and up (there are ports for other platforms, but that's a whole other letter). 4.) Unlimited, free tech support from hundreds of helpful Usenet and IRC experts. 5.) Tons of software (much of it free.) 6.) Not as hard to use as you think. 7.) A charismatic figurehead who actually participates in the OS's development.

delocke

I'd like to reply to the reader in *boot* 10 about the 64-bit Linux OS. Linux does have a 64-bit version, but it only runs on the DEC Alpha chip. The versions that will run on an Intel chip are only 32-bit. He's referring to a proposed OS that we power users could appreciate. One that is 64-bit—or even 128-bit—and OpenGL. I've heard rumors that Microsoft is working on a 64-bit version of Windows for the Merced release. If true, they'll probably screw it up and make it backward compatible. I'm in the process of finding info about the development of an OS Kernel, which is why I'm interested in Linux and would love to coordinate with other *boot* readers to develop a proper OS.

Steve Faul

I'm Not a Doctor, but...

In Shel Kimen's column in *boot* 11 ("When Push Comes to Shove"), she has a temper tantrum when the American Medical Association suggests that medical advice given over the Internet have some boundaries. Of course there should be boundaries for this kind of advice. It should be monitored and regulated.

She also blathers on about how aspirin and Midol do not have the warning that the AMA suggested should be put on medical Internet sites. Of course they don't, they're regulated by the FDA.

Zachary Taylor

Columnist Shel Kimen replies: *With regard to the AMA, we differ in opinion. Midol was an extreme example of a very serious problem with our pharmaceutical industry—I was merely pointing out an absurdity to confront an absurdity.*

The issues raised by Shel Kimen in *boot* 11 are the same as those that created the Internet: control of information sources.

Attorneys have a vested interest in the consumer not going to the law library and reading the books. CPAs get big bucks for reading the tax code and telling folks how to dodge the tax man. Doctors don't want an educated consumer because it would mean they'd have to stay abreast of changes. And HMO's don't want customers asking questions about treatment plans; just take the pill and don't come back real soon.)

Media conglomerates want Push technology. It simplifies the marketing of stuff. I'm glad someone is asking questions about Push(ers) value to the consumer and whether the technology even works.

John Oram

Am I missing something here? Shel Kimen's the first person I've seen who has talked about what "they" are trying "push" down our throats. But then again, we Americans are lazy and like to have world affairs fed to us, preferably in small "bites." The Internet is the greatest thing to have happened to citizens of the world since satellite TV, which crossed all

borders and made it impossible for governments to spoon-feed us! Let's not take a step backward. Next thing you know, the FCC will require that everyone get a license in order to have a web site.

Raymond Cain

3Dmania

More 3D please! *boot* is the only mag dealing with the subject, but with so many products, specs, and new specs coming out almost weekly, I'm getting confused. Will the new boards providing AGP support still give fantastic graphics on older motherboards? Will all these new cards support Direct3D 5.0? Hopefully, *boot* can sort the cream from the crap.

Paul Luchette

Tech editor Chris Dunphy replies: *Let's clear up some confusion about AGP. AGP provides a direct path between the graphics chip and main system memory. AGP will allow graphics cards to take advantage of huge amounts of textures, and will mean graphics cards require less onboard memory and will therefore cost less. To take advantage of AGP, your motherboard must support it, and you must have an AGP slot to plug in these new boards. An AGP board won't fit in a PCI slot.*

Also be aware that all AGP implementations are not created equal. Some of the first graphics chips coming out that claim to be AGP-ready in fact implement only a subset of the spec. Only chips that support AGP 2X (133MHz) with sideband addressing will really be able to take advantage of the advantages that AGP offers. The ATI Rage Pro chip is the first to support this full AGP feature set, but others will follow.

The other thing to watch for is the memory bus speed in the system. Even if the graphics chip is talking at 133MHz, there may be a bottleneck if the main memory is running at 66MHz. Once Intel ups the system bus speed to 100MHz (rumored to be coming in Deschuetes), AGP has the potential to really fly.

Rest assured that boot *will remain the ultimate resource for the best info on 3D accelerators. We won't let no crap get through.*

High-Speed Buses

I read in *boot* 11 that the new breed of video cards will be running their SDRAM at a speed at 133MHz up to 206MHz. Is that just the chip speed or the bus speed? Are the new AGP buses going to run at the same speed as their chipset? It also says that one new card is going to pump 100fps. And on one of the cards it said that it was going to have 12K of onboard cache. Is this going to speed up the fps on this card? In the new computers are they going to put a new bus on the motherboards coming in 1998? When are they going to bypass the x86 architecture and start making the apps on a new architecture?

Michael L Burns

Tech editor Chris Dunphy replies: *The speeds you're referring to are the speeds at which the graphics chip talks to the onboard memory. The fastest boards available now max out talking to 100MHz SGRAM, but over the course of the next year SDRAM speeds may double.*

AGP, on the other hand, runs at either 66MHz or 133MHz, referring to the speed that the graphics card can communicate with the main memory. AGP is a new bus, and future motherboards will likely sacrifice a PCI or ISA slot to provide an AGP slot.

Sounding off Against The Saint

I subscribed a couple of days ago and really like *boot*... especially the interview with Microsoft's DirectX architect, Alex St. John (*boot* 04, 05). Some might say his group bulldozed 3D sound. In fact, I believe their actions have actually delayed, rather than helped, the overall incorporation of low-latency technologies into Windows.

Bo Gehring

Columnist Alex St. John replies: *There's no chance whatsoever that the DirectX effort in any way impeded getting real-time support into the OS. If anything, we were its sole champions.*

There'd be no 3D audio solution offered by Microsoft if DirectX hadn't existed. Bo may not be pleased with the way DirectSound3D evolved at Microsoft, especially if it didn't require any of his patents, but I'd be very interested to hear him make the case that something else, or something better, would have come along if DirectSound3D hadn't been made.

If you think Direct3D is a headache, you should see the stuff that didn't get past me.

Beam Me Up, Scotty

Can you please please please include *Netscape Communicator* on your *bootDisc*? Some people (such as myself) don't want to spend a half dozen or so hours downloading it.

Mary Harvey

Disc editor Sean Cleveland replies: *We wish we could. Netscape is very anal concerning its software licensing and prefers that it be downloaded directly from the Netscape site. This forces people to use a competitive browser in order to get to the site. It must work for them though...*

Waiting for the New Millennia

My gripe is with Micron and its new Millennia MME w/Sonic Fusion 3D. I ordered one on June 9. Micron said it would ship on June 30 and I'd receive it on July 2. When it didn't ship on June 30, I called and was told that the CD-ROMs were out of stock and it would ship July 7. Again it didn't ship and again I called. This time I was told that because of the backlog, they were having trouble getting them out the door and it would ship at the end of the week. The customer service woman even asked if I'd like her to call to confirm the ship date. By July 11—after no phone call—I was more than a little miffed. So I called again and was told there was a good chance it would ship that day. I was told to call back before 5 p.m. and verify. I called back and this time was told that the model I had ordered more than a month ago was not even in production yet. They were still working out some problems and it may ship at the end of next week.

By this point I was ready to kill (if only you could reach out and touch someone). I've been lied to repeatedly and jerked around like a fish on a line. A damn supercomputer couldn't wash away the bad taste I have after this experience. I must say that my ordeal does make sense if you consider Micron's advertising campaign about building a bridge to the 21st century. Call us when you get there. By then the computer should be built and ready to ship.

Walter Legge

A Micron representative replies: *After extensive investigation, it has been discovered that the reason for this customer's delay was twofold: First, the Sonic Fusion upgrade is a new product to Micron and required additional testing, which is common when bringing cutting-edge technology to the market. This is why Micron works with "estimated" ship dates. The second cause was a CD-ROM shortage experienced by Micron. It has been confirmed that the customer's order shipped on July 16 with free next-day service, in an effort to cultivate a positive relationship.*

Incidents such as this are reviewed to ensure that other customers do not experience a similar situation. Micron understands the importance of living up to commitments and extends its sincerest apologies to Walter.

"By this **point** I was **ready** to **kill**... I've been **lied to** repeatedly and **jerked** around like a **fish** on a line. A damn **supercomputer** wouldn't be **able** to **wash** away the **bad** taste..."

Cut, Copy, Paste

The Micronics M55Hi+ reviewed in *boot* 11 has three ISA slots, not two as reported.

The URL for *Forgotten Realms: Baldur's Gate* (previewed in *boot* 12) should have been listed as **www.dragonplay.com.**

The C6 CPU mentioned in *boot* 11's cover feature is made by IDT, not ITC.

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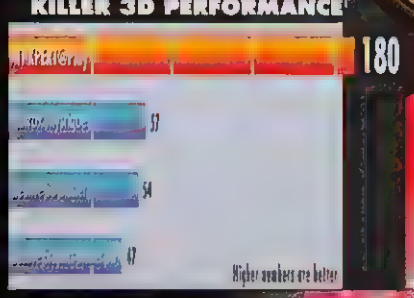

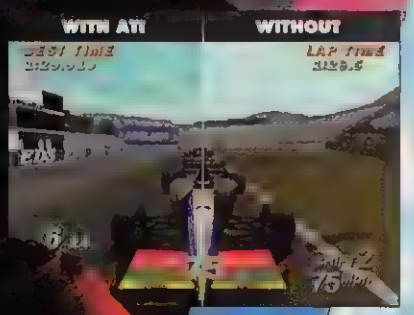

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Now You See It.

Product Information Number 85

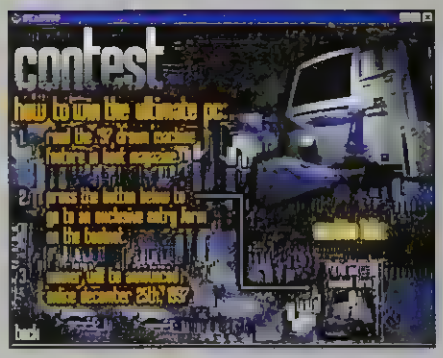
bootDisc

This month's bootDisc interface goes pure 32-bit. This means you'll need at least Win95 to run the interface. The bootDisc is finally fully NT-compatible. Don't worry, 16-bit users. To install a demo from Windows 3.x, use the File Manager and launch the file from the Location section below.

TRY IT ON THE DISC

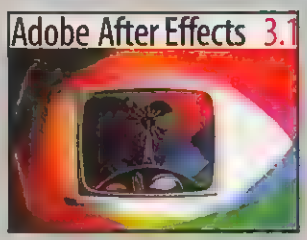
To use the *bootDisc*, place it in your CD-ROM drive and the menu above will automatically pop up. If it doesn't pop up, open Explorer via the Start button, click on your CD-ROM drive and double-click the 'Start95.exe' file.

ON THIS MONTH'S DISC:



Now it's* boot*'s turn to show the world just what Pure PC Power is. The 1997 Dream Machine is all of that (and a bag of spare chips). Be sure to enter our contest to win this Dream Machine. Simply click on the middle of the rotating disc in the main interface to find the secret screen that will take you to a classified page on the* bootNet *web site for your chance to enter the contest.

If you're really lucky,* boot *will be stuffing your stocking this Christmas.



With *After Effects* you can creates special effects and 2D animation. It also features unlimited-layer compositing
Requirements: 486 with 16MB of RAM and 26MB of hard disk space.
Demo includes the features found in the full version, except Save and Render. The Tutorial is in the AftrEfct\Wintutor directory.
From Adobe for Win95.
Location: Aftrefct\Setup.exe
See the review on page 81.

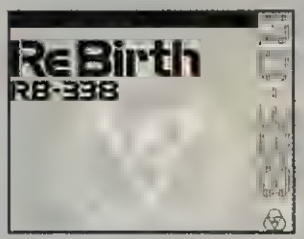
From SVGA graphics to hand-painted characters, Sierra has updated and re-engineered their RPG engine.
Requirements: Pentium 60MHz with 16MB of RAM and 25MB of hard disk space.
This sample contains a large portion of the eastern coast of Antara, with towns, farms, people, creatures, and fights
From Sierra On-Line for Win95.
Location: Antara\Setup.exe
See the review on page 106.

This baseball sim includes the Camera Angle Management System with 10 all-new pre-set camera angles for easy viewing. The game includes 28 Major League ballparks.
Requirements: DirectX 3.a, 60MHz Pentium 16MB of RAM and 42MB hard disk space
This is 3-inning demo contains all player animations rendered to 16 frames
From Sierra for DOS & Win95
Location: Fps_bb98\Setup exe
See the review in *boot* 12 on page 105.

Pilot a 21st century attack helicopter and drive the next-generation battle tank! This real-time 3D game looks great yet doesn't require a 3D card.
Requirements: Pentium 90MHz with 16MB of RAM and 40MB of hard disk space.
This demo contains both the normal and a 3Dfx version.
From Blue Byte for DOS & Win95
Location: Xassault\Setup exe
See the review in *boot* 12 on page 94.

Kai's Photo Soap's intuitive, easy-to-use interface allows anyone to perform sophisticated image editing functions. Colorful controls and animated tools allow instant cropping, touch-up, and color correction
Requirements: This demo requires you to be online and will take you to MetaTools' web page for an online demo of *Soap*.
From MetaCreations
Location on the Web:
www.metatools.com/soap/index.html
See the review in an upcoming issue.

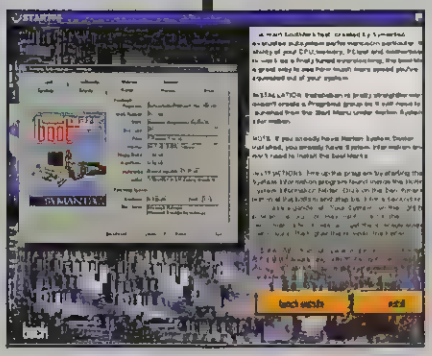
Strap on your helmet and race these high-powered real-life Formula One race cars in this hardcore racing sim. The slew of extensive statistics is based on actual Formula One data and, as a bonus, all 17 Formula One tracks are accurately modeled to the smallest detail
Requirements: 486 66MHz with 8MB of RAM and 12MB of hard disk space
From Eidos Interactive for DOS & Win95.
Location: Powerf1\Setup.exe
See the review on page 109.



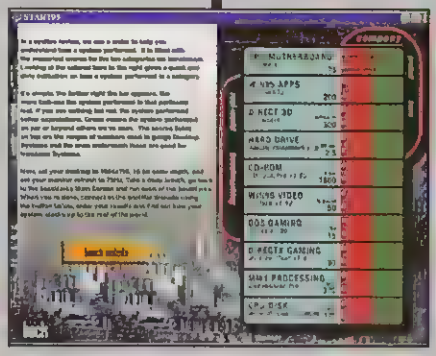
Two silver synths and a black drum machine. Two pieces of classic analog synthesizer hardware reincarnated as software. All the quirks and subtle qualities of analog synths coupled with the convenience of modern computers. Yet with that unmistakable analog sound
Requirements: Pentium 75MHz with 16MB of RAM and 5MB of hard disk space.
From Stemberg for Win95.
Location: Rebirth\Setup.exe
See the review on page 87.

Twinsens's Odyssey Take a voyage on a 3D action-adventure with over 60 hours of gameplay. Pilot flying dinosaurs, dune buggies and spaceships to explore over 200 stunning environments on three planets. Use quick reflexes, ingenuity and magic to save the planet from invading aliens.
Requirements: Pentium with 16MB of RAM and 25MB of hard disk space.
From Activision for Win95.
Location: Twinsens\Setup.exe
See the review on page 94.

Are you a blood-thirsty gaming hound who hungers for interactive action? Do you long for late-night sessions with a worthy opponent who challenge your maniacal nature? Do you have the nerve it takes to keep up with fragmasters the world-over? Here you'll find everything you need from the hottest gaming services talked about in the Multiplayer Feature. All of it is gathered here, in one place, so you can spend more time gaming and less time dredging.



Pure bootMarking Power. The bootDisc *is now armed with all the information you need to run the bootMarks. We've added step-by-step text to make sure the results you get are correct and full explanations so you understand why we use each one.*



What good are tests if you have nothing to compare the results to? Here you'll learn what the meter is all about and how it's implemented in a system review. Also included is the range of numbers we use to score a system. Have questions? After reading this you won't.

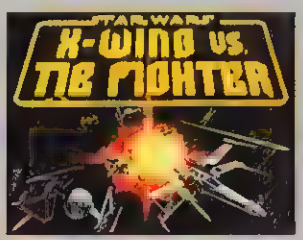
HyperWire is for building interactive web content no knowledge of Java required. It's ideal for Intranet developers.
Requirements: Pentium with 16MB of RAM and 26MB of hard disk space.
This Test Drive is a 30-day, time-locked version of the full shipping version. Be Patient. Setup takes a few seconds to start.
From Kinet.x for Win95
Location on the Disc: Hyprwire\Setup.exe
See the review on page 90.

Legacy of Kain contains 170 enemies and 21 spells—each with a unique bloody graphic, 100,000-plus screens and 120 hours of full-motion 3D animation..
Requirements: Pentium with 16MB of RAM and 25MB of hard disk space
NOTE: May not work with Matrox Millennium cards
From Activision for DOS & Win95.
Location on: Kaindemo\Setup.exe
Not reviewed in this issue.

With *Magix Music Studio*, you can add numerous effects, speech and songs, integrate MIDI files and record the new mix directly onto your hard disk All on 4 tracks and in DAT-quality up to 48kHz
Requirements: 486 with 16MB of RAM and 10MB of hard disk space
This demo is save-disabled
From Magix for Win95
Location: Magix\Setup.exe
See the review on page 96.

There's no need to learn HTML or master complex appl cations. *PageMill* has all the tools needed to create and deliver an attention grabbing, well-designed site.
Requirements: 486 with 16MB of RAM and 8MB of hard disk space.
This trial version is fully functional for 15 days
From Adobe for Win95 & NT 4.0
Location : Pagemill\Setup.exe
See the review on page 107.

X-COM: Apocalypse s turn-based combat engine has been improved so you can see animations of all your X-COM agents running, crawling and kneeling in fluid animated motions. Gravity has been added and walls, floors and ceilings react the same as you'd expect in the real world.
Requirements: Pentium with 16MB of RAM and 20MB of hard disk space.
From MicroProse for DOS & Win95.
Location: Xcomapoc\Setup.exe
See the review on page 106.



This demo version of the multiplayer sequel wasn't ava lable at review time.
Requirements: Pentium 90MHz with 16MB of RAM and 12MB of hard disk space.
This demo includes one cooperative mission and one melee mission. Both missions can be flown in either the X-Wing or TIE interceptor, in either solo mode or with other players
From LucasArts for Win95
Location: Xwingtie\Setup.exe
See the review in *boot* 11 on page 80.

boot MicroCinema

This month's MicroCinema includes movie previews of some of the hottest games that'll be lighting up your CRT. Media Station's ***Extreme Tactics*** takes you to a future where coolar crystals are worth dying for. Wanna get pumped? Peek at the intro to Activision's ***Heavy Gear*** to see what lies ahead for reckless gear pilots. All the fuss about MMX is justified by our reel or Epic MegaGame's ***Unreal***, and Bullfrog's ***Dungeon Keeper*** preview shows off a little of what to expect in this excellent underground affair.

Extreme Tactics

Heavy Gear

Dungeon Keeper

Unreal

What Went Wrong?

POSTAL

Find out at www.gopostal.com

Download the free mini demo on our website or call 1-888-797-5867 for a fully loaded demo disk (use the code words "gas chamber"). And yeah, there is a charge - but don't go Postal - it's only 5 bucks.

RUNNING WITH SCISSORS

ripcord GAMES

RATING PENDING
RP
CONTENT RATED BY ESRB

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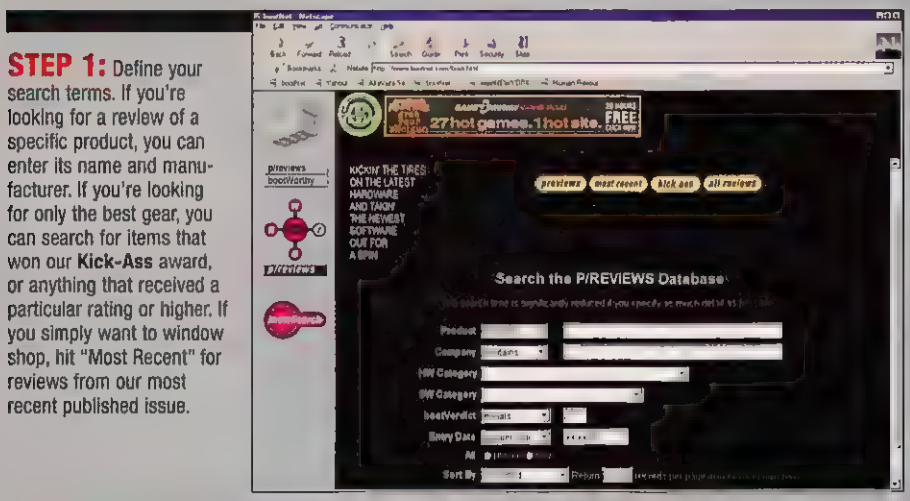
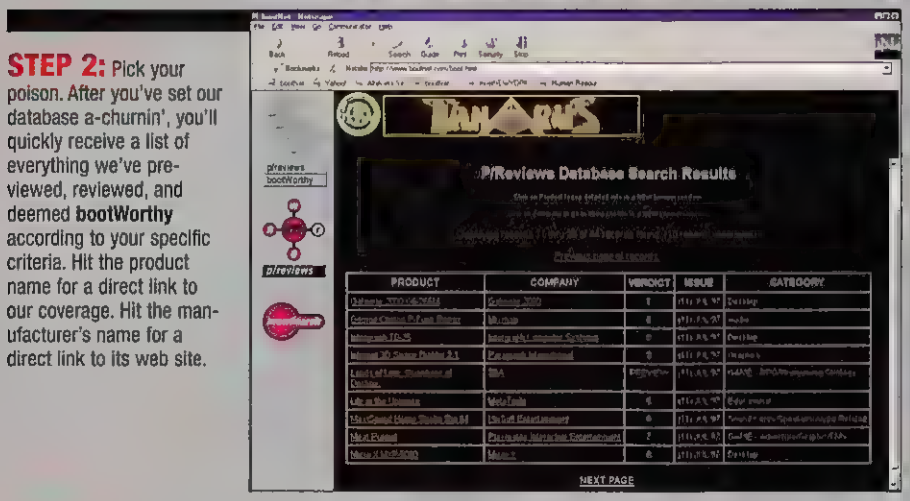
BEFORE YOU BUY **ANY** COMPUTER, SYSTEM COMPONENT, OR PIECE OF SOFTWARE, GO TO **WWW.BOOTNET.COM** WE HAVE **FULL** ILLUSTRATED REVIEWS OF EVERYTHING WE'VE **EVER** REVIEWED.

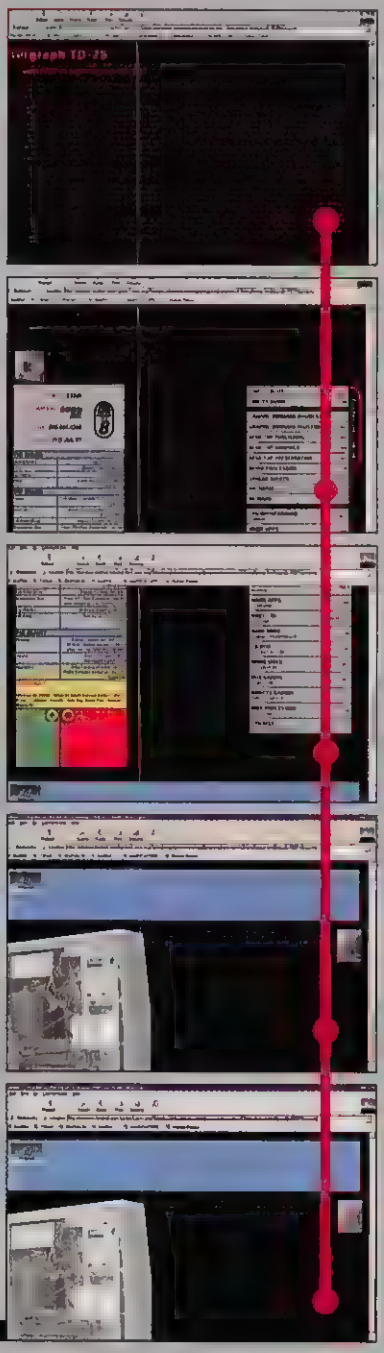
Don't be fooled: *The world of computer shopping is fraught with shady hucksters who would sell you* ***silicone implants*** *if they thought they'd fit in a PCI slot. Protect your money with a trip to the* ***bootNet's*** *incredible* ***P/Reviews*** *database. Finding the perfect hardware and software for the right price is just a* ***mouse click*** *away.*



STEP 1: Define your search terms. If you're looking for a review of a specific product, you can enter its name and manufacturer. If you're looking for only the best gear, you can search for items that won our **Kick-Ass** award, or anything that received a particular rating or higher. If you simply want to window shop, hit "Most Recent" for reviews from our most recent published issue.



STEP 2: Pick your poison. After you've set our database a-churnin', you'll quickly receive a list of everything we've previewed, reviewed, and deemed **bootWorthy** according to your specific criteria. Hit the product name for a direct link to our coverage. Hit the manufacturer's name for a direct link to its web site.



STEP 3: Once you hit the name of the product, a new browser window will open featuring all the text and screenshots that were published in the original issue of ***boot***. We spare no details. You get full reviews, and for desktop systems and notebooks, you get full **bootMarks**, specs, parts lists, beauty shots, and gut shots.

CPU Prices Tumble Yet Again

AMD keeps pace with Intel's latest cuts

Just last June, Intel announced price reductions across its entire processor line—except the Pentium II. Now, reflecting a planned increase in production, Intel will drop the price of its P-II 300MHz processor from $1,900 to $830 starting in August. Prices have also been shaved across the entire Pentium II line, the P-II 266 falling from $775 to $650, and the P-II 233 from $636 to $520, representing reductions of 16 percent and 18 percent respectively.

Intel has also revised its price cuts for the MMX line of processors, with the P233 MMX chip priced at $355, the P200 MMX at only $235, and the P166 MMX at $135. Even the prices of non-MMX models have been slashed and will now sell for less than $100 each (and $20 less than what Intel had originally announced).

AMD vowed to keep pace with Intel during these processor price wars, telling *boot* it will continue to maintain pricing at least 25 percent below Intel's. Following Intel's planned price cuts across its entire line of Pentium MMX and Pentium II processors, AMD, as expected, announced it would begin slashing the price of its K6 processors—almost in half for some models.

In August, AMD's K6-166MHz falls from $190 to $109, and the K6-233MHz falls from $415 to $290. However, the biggest drop—almost 50 percent—has been reserved for the K6-200MHz, which will be available for $189. By comparison, Intel's P200 MMX will sell for $235, or approximately 20 percent more than the AMD offering.

Lest you believe AMD has fired the last

NUGGETS

Blue Light Special Boosts DVD Capacity and Speeds

By using blue lasers, Hitachi plans to triple the current data capacity, and speed up access times by 5x for DVD drives. The shorter wavelength of the blue light source is capable of reading data at a much finer resolution. Current DVD-ROM drives hold 4.7GB single-sided and 8.5GB on double-layered discs. The new technology will store 14GB and 25GB respectively.

In addition to capacity increases, access times will surge from the current 100ms to 200ms speeds to the new 20ms to 40ms range.

Much-anticipated DVD-RAM drives will also benefit from the breakthrough with capacities surging from 2.6GB to 8.4GB, and access times lunging from 50ms to 100ms to speeds comparable to today's best fixed hard drives, with a 5ms to 10ms range.

The new drives will be compatible with all DVD and CD-ROM discs, and should be available sometime between 1999 and 2001.

New Architecture Makes 512MB RAM Possible

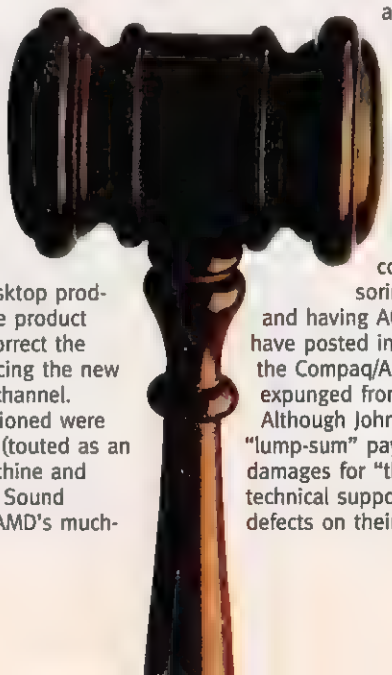
Micron's first samples of its 256-megabit (Mb) DRAM chip are making their way to major system manufacturers, while Samsung and LG Semicon are still trying to move from 16Mb DRAMs to the higher-density 64Mb chips.

Most PCs use 16Mb DRAM or 64Mb DRAM, but the new 256Mb memory modules will yield four times as much memory as 64Mb technology.

Compaq Slapped by Disgruntled Customers

Class-action lawsuit filed against the company

A disgruntled PC user who was fed up with the problems he was having with his two new Presario systems—models 7240 and 4112—has filed a class-action lawsuit against Compaq. The complaint, filed in the North Carolina Superior Court Division, contends that Compaq "misrepresented its products, breached its warranty agreements, and committed consumer fraud," in the hope of selling more computers.



The suit also accuses Compaq of conducting unfair and deceptive business practices, and alleges that Compaq product managers knew their desktop products suffered from severe product defects but refused to correct the problems before introducing the new products into the retail channel. Among the defects mentioned were Compaq's Phone Center (touted as an "effective answering machine and speakerphone") and the Sound Blaster compatibility of AMD's much-maligned Interwave sound card, which was discontinued earlier this year (see story in *boot* 04.) Interestingly enough, even the *boot* Lip interview with Compaq vice-president Rod Schrock is referenced in the 20-plus page missive.

Dale Johnson—the initial plaintiff—claims the lawsuit is "is for all the people who want to see Compaq held accountable for the defective PCs it has sold." He charges that Compaq has "engaged in unfair and deceptive conduct by rushing defective products to market," and accuses company officials of censoring messages on AOL, and having AOL members who may have posted inflammatory e-mail on the Compaq/AOL message boards expunged from using the service.

Although Johnson isn't seeking a "lump-sum" payment, he is asking for damages for "those users charged for technical support when trying to fix defects on their PCs."

salvo in the never-ending price war, think again. Intel's already told its OEM customers to expect additional Pentium MMX price drops—up to 18 percent—in November.

In related news, AMD also disclosed that it was ceasing production of its K5 line of processors in the third quarter of this year, and not the end of the year as had been previously planned.

RAM Consumers Win Memory Price War

DRAM prices dropped again in June, thanks to U.S. manufacturers picking up the volume of 16-megabit DRAMs while many Japanese manufacturers moved to the more profitable 64-megabit market. Chip prices for DRAM and EDO DRAM dropped 10 percent to 14 percent, bringing the cost down to between $6.20 and $7.00 a chip.

Based on the new pricing structures, 16MB modules should see retail prices as low as $65.

With their massive storied inventory of DRAM chips teetering precariously, South Korean manufacturers Samsung Semiconductors, Hyundai Electronics, and LG Semicon are taking a summer vacation from chip production. The companies will shut down operations during the last week of July in an attempt to restore balance to the delicate laws of supply and demand.

Current production capacities exceed the market's need, driving prices down. The downward spiral has been capped off by a 15-percent plunge in the previous month alone.

The planned work stoppage will enable manufacturers to thin existing stock of 16MB chips without creating market chaos.

The damage request relates to Compaq's previous policy of charging consumers for hardware support during warranty periods. In January, Compaq started a new technical support program where customers with "non-hardware defect problems" were asked to call a special 1-900 line where they were charged $35 per question or $2 per minute (up to a maximum charge of $30) for technical support assistance. In May, after being inundated with calls from angry customers who felt they were being unfairly gouged, Compaq modified the program so that charges would be incurred only if the warranty period had ended. The complaint contends that Compaq charged these fees despite the fact that it 1.) already knew about the defects, 2.) knew it had no solution to correct the defects, and 3.) did not disclose the defects to consumers prior to their purchase of Compaq products. For his part, Johnson says he was forced to fork out approximately $218 for such support.

Dale Johnson has filed a class-action lawsuit against Compaq "for all the people who want to see Compaq accountable for the defective PCs it has sold."

Compaq's Presario systems are at the center of the suit.

Now that the complaint has been filed, the state court will examine the supporting documentation to determine if it is worthy of class status certification. If it is, anybody who purchased a Compaq Presario computer between January 1, 1996 and the present, and who experienced defects similar to the ones outlined in the suit, will be notified and asked to join the suit.

When reached for comment, Compaq officials told *boot* "company policy prohibits any statements regarding pending litigation."

For further information about this suit, a copy is available online at: http://users.aol.com/CClass450/index.htm. Presario owners can also e-mail jeffs@hagens-berman.com of Hagens & Berman, the plantiff's attorneys.

NUGGETS

By using multiple memory modules, capacity for PCs is measured in megabytes (MB). Today's PC with 32MB of RAM uses a total 16 of the 16Mb DRAMs. Sixteen 256Mb DRAMs can crank out a awesome 512MB of RAM. But, you'll most likely see 64MB or 128MB RAM modules based on the new, more expensive DRAM. Users blessed with PCIsets supporting massive amounts of memory, but cursed with motherboards armed with four or less RAM slots, can now fill them to the rim for maximum memory pleasure.

Dell is already sampling the new RAM for its forthcoming notebook and server systems.

Fujitsu Speeds Up 3D Geometry With New Chip

Japanese electronics giant Fujitsu has announced its entry into the crowded 3D graphics chip market with a 3D geometry processor called Pinolite. Unlike other 3D chips on the market, the Pinolite doesn't do its own 3D rendering per se. Instead, it accelerates the geometry calculations usually done by the CPU, leaving the main processor free for other tasks. Fujitsu claims that the Pinolite can provide geometry for between 500K to 750K triangular polygons per second, approximately the same number a Pentium II 266MHz can generate. A Pinolite-equipped Pentium II will be able to maintain 3D speed while allowing the processor to spend more time on gameplay and other tasks.

The Pinolite chip will be available to board manufacturers in quantity for $26 in September. No word yet as to which 3D board manufacturers are considering using the chip.

ISDN Fails to Deliver Promised Speed

If you're looking forward to blazing 128Kbps performance from ISDN, prepare for a disappointment. A technical glitch commonly prevents ISDN from reaching its potential throughput, achieving only half the celebrated rates.

The problem occurs when Internet access equipment at the ISP level fails to pair an incoming caller's two 64Kbps B channels into a single 128Kbps pipe. The two channels frequently terminate on different WAN access devices, which often lack the sophistication to bond the related calls together.

Short-term solutions include dedicated modems and router ports.

INTERNET GAMING ZONE

lock. Then it's bye-bye until tomorrow. When I crush them in my monster truck.

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I go to see my friends. In the targeting sight. I see them long enough to get a

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blasts like spit because I like to go all out on everything. Except my wallet.

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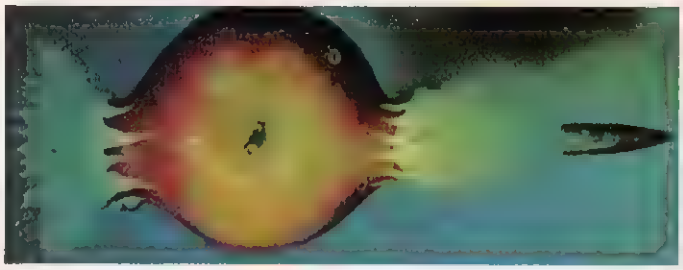
Apple Computer Struggles to Survive

Recent events put company's future in jeopardy



Exactly a week before its third quarter financial results were to be released, Apple's publicly maligned CEO, Gil Amelio, resigned. Also bailing from the troubled ship was executive vice president of technology, Ellen Hancock.

Just prior to the surprise announcement, a survey of financial analysts predicted that Apple would announce losses ranging anywhere from $70 million to $400 million. Considering that Apple had recorded a total loss of $708 million in the previous quarter (including a $375 million write-off in R&D costs relating to its acquisition of Steve Jobs' NeXT Software), these estimates weren't all that unrealistic. However, Apple proceeded to shock doomsayers when it announced a net loss of only $56 million, on sales of $1.7 billion.

Apple hasn't yet announced Amelio's replacement. Day-to-day operations will be handled in the interim by CFO Fred Anderson, who joined the company a scant 18 months previously. The company did reveal that Steve Jobs will assume "an expanded role as a key advisor to Apple's board of directors."

Outgoing CEO Amelio

However, rampant speculation has Jobs behind the recent sale of 1.5 million shares of Apple stock (he was given the shares last May as part of Apple's NeXT acquisition). The stock dump hasn't officially been linked to Jobs, but if it is his, chances are he'll find himself answering questions from the SEC, among others.

Hancock's also gone

Cheryl England, editor-in-chief of *boot*'s sister publication *MacAddict*, said she is "cautiously optimistic" about Apple's survival, but added, "considering [Amelio] contributed to Apple's downfall, his departure is ultimately a good thing for the company."

Adding to this vacuum at the top is the recent resignation of Delano Lewis from Apple's board of directors. His departure leaves four of the company's six external board seats unoccupied.

Apple's remaining board members have retained Heidrick & Struggles, a global executive search firm, to assist in the search for a new CEO. According to an Apple press release, the firm will seek a world-class technology industry executive who possesses a "successful sales and marketing background and an established industry reputation." Although Apple hasn't commented on when it expects to fill the position, searches of this magnitude usually take months.

While Apple executives concern themselves with finding a new top dog, the company continues to move forward. In late July, Apple introduced Mac OS 8, the most significant upgrade since 1984. Later this year, Apple is expected to release Mac OS Runtime for Java, and several new desktop systems, including Kansas, utilizing a Mach5-300MHz processor, a subset of the PowerPC 604e chipset.

For a clear reaction to Apple's woes, one need not look any further than to leading Macintosh clone maker Power Computing, which has indicated (through an IPO filing with the SEC) its plans to begin building Intel-based Windows PCs starting in early 1998. Hoping to use its Mac expertise to sell PCs into environments where cross-platform support is necessary, Power Computing will be bringing out NT servers preconfigured for serving both Mac and PC end-users, as well as Intel-based desktop and notebook machines. Although Power Computing has no plans to drop its existing Macintosh-compatible line, this move must be taken as a lack of faith in the Macintosh platform and Apple's on-again, off-again support for clone manufacturers.

NUGGETS

Adaptec Unveils 50x CD-ROM Controllers

Hot on the heels of Cirrus Logic's 45x CD-ROM controller, Adaptec is sampling its new 50x controller to manufacturers. The AIC-9570 Ultra ATA is the fastest to date, enabling host data transfers up to 33MB/sec using Ultra DMA protocols. The controller also supports standard ATAPI interfaces, and is fully scalable to take advantage of SCSI and FireWire interfaces.

Volume shipments of the chipset will begin in August with a price tag of less than $10 per unit to OEMs.

Intel Ups Mobile Speed Limit

Intel's next generation of mobile Pentium processors will hit 200MHz and 233MHz speeds come late summer. While many notebook manufacturers have already integrated faster desktop P55C CPUs into some of their models, the new breed of authentic mobile processors should stop that hot practice. Intel's new CPUs also claim to match their desktop brethren's performance.

Notebook manufacturers are also expecting to pump up their products with gobs of hard-drive space, bigger displays, and more memory to help move more users into the mobile realm, and solidify their desktop-alternative status. Once these processors hit the market, expect the costs of the current top-of-the-line notebooks to plummet into the high $2Ks

Intel's mobile Pentium II won't happen until next year at the earliest.

PC98 Specs Nearly Finished

Get your wallets ready, the PC98 specification is just around the corner. Co-authored by Microsoft, Compaq, and Intel, version .9 of PC98 attempts to banish many bottlenecks currently plaguing PC architecture.

Faster bus architecture for 3D graphics will be required—specifically a 66MHz or 100MHz internal bus and a 64-bit PCI or AGP bus. Bus-mastering IDE hard drives will be considered a minimum requirement, with SCSI drives for power users and workstation applications. The spec also recommends RAID storage for workstation systems.

The CPU-intensive ISA bus was destined for extinction, but surprisingly, PC98 only "recommends" its removal, not requires it. However, OEMs including ISA in their systems after January 1999 will not be granted the right to use Microsoft's Windows logo.

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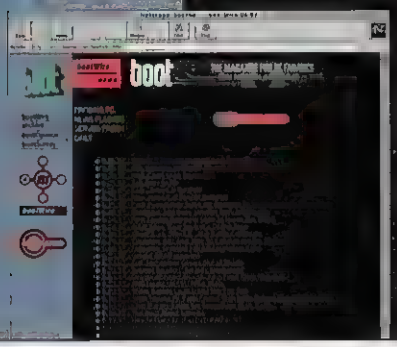

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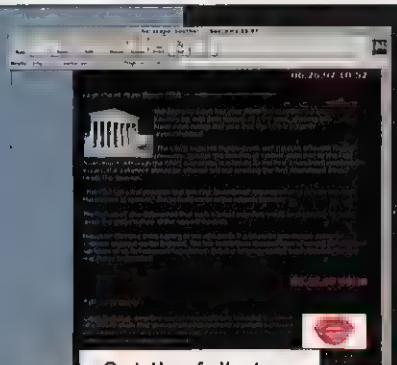
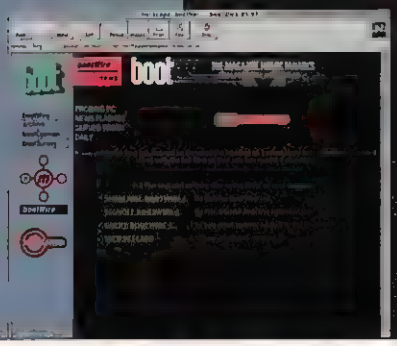


Get the full story



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HIGH-TECH **TOYS** AND **TOOLS** WITH THE **RIGHT STUFF**

COMPILED BY DAVID PESCOVITZ

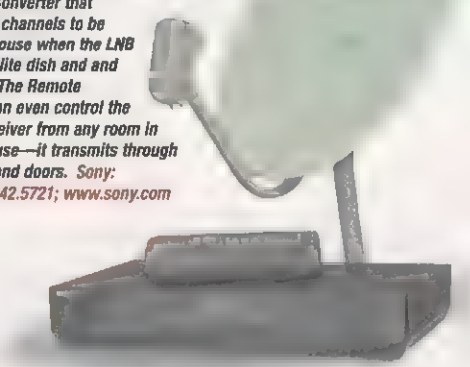
Prototype

WIRELESS PILOT *Novatel Wireless' Minstrel Pilot Modem takes the exquisite PDA to the next telecom level with wireless IP connectivity. Bundled with a POP3 E-mail client and a text-based web browser (that's right, web browser!), the Minstrel features an AT command set, built-in TCP/IP, UDP and SLIP protocols, full-duplex CDPD operation, and a data input rate of 300bps to 19200bps. Two choices for power are available—six AAA Alkaline batteries will keep you connected for two weeks while one Ni-MH lasts three to five days. The Pilot with the Minstrel attached is 6.1-inches long, plus the antenna, and weighs in at 14 ounces. The $399 Minstrel can also be used as an external wireless modem with other PCs. Wireless service is available through numerous providers across the country. Novatel Wireless: 619.784.0620; www.novatelwireless.com*

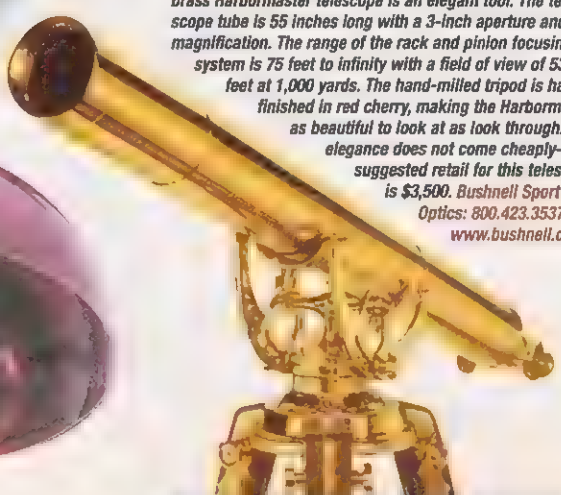
FAR AWAY PHONE *Lucent Technologies' new 900MHz Digital Cordless Telephone 9510 goes the distance—4,000 feet in fact. That's about six times the range of conventional analog cordless phones. And range isn't the only thing that sets this phone apart—"frequency hopping," originally developed for the military, keeps calls secure by digitally encoding the signal and then "hopping" it 200 times per second randomly through 50 of the phone's 173 channels. Echo canceller software in the phone's base reduces the echo of your voice through the earpiece, and the flip-style design makes the handset a nice pocket-size. Lucent Technologies: 800.222.3111; www.lucent.com/consumer*

HAND-EYE COORDINATION *The Glove, from Reality Quest, is a next-generation video game controller that fits, well, like a glove. Strap it on over your right hand and Reality Quest's wrist-motion sensing technology tracks your hand movement. True point-and-click—bend your wrist for direction control and hit the action buttons ergonomically placed under your fingertips. The Glove fits most hand sizes, age 12 and up, and is available for the Sony PlayStation and Nintendo 64 for $89.95. Reality Quest: 888.964.5683; www.theglove.com*

HYPER CHANNEL SURFING *Can't decide between ESPN, QVC, and the three Star Wars films? Sony's SAS-AD2 DSS system features a 32-bit microprocessor that enables menu jumps and channel surfing five times faster than most other DSS systems. The $700 system also includes a Dual Low Noise Block Down Converter that allows different satellite channels to be viewed throughout the house when the LNB is connected to the satellite dish and and additional DSS receiver. The Remote Commander can even control the DSS receiver from any room in the house—it transmits through walls and doors. Sony: 800.342.5721; www.sony.com*



LAND HO *From Bushnell/Bausch & Lomb, the polished brass Harbormaster telescope is an elegant tool. The telescope tube is 55 inches long with a 3-inch aperture and 35X magnification. The range of the rack and pinion focusing system is 75 feet to infinity with a field of view of 53 feet at 1,000 yards. The hand-milled tripod is hand-finished in red cherry, making the Harbormaster as beautiful to look at as look through. But elegance does not come cheaply—suggested retail for this telescope is $3,500. Bushnell Sport Optics: 800.423.3537; www.bushnell.com*

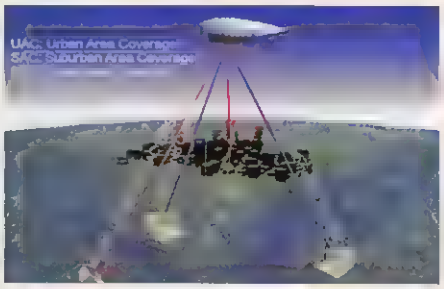


NO MORE HEADPHONES *It may look like a light fixture from* Barbarella, *but Brown Innovations' Virtual Audio Imager speaker system projects each channel of a stereo signal into the appropriate ear of the listener. The concentration of the sound blocks out background noise "as if the individual is walking into his/her own personal isolated three-dimensional acoustic world." All hype aside, that's actually a fair description. Hang one of these $995 spacey domes over your computer or easy chair and lose yourself in the far-out sounds of hi-fi stereo. Lava lamp not included. Brown Innovations: 773.296.6400; www.purestereo.com*

TIME FOR YOUR CLOSE UP *Console Quake on a 15-inch screen halfway across the room? Forget it. Samsung's GXTV was designed for up-close video gameplay. The 13-inch screen has low-emissions and a picture tube that's resistant to burn-in. But it's the bass that makes this thing kick—a built-in 15 watt subwoofer, 175 degree adjustable bass-reflex speaker doors to surround your skull with sound, and individual bass and treble controls to fine-tune the sounds of space wars or road races. With two A/V inputs, one A/V output, 181-channel tuning, and a backlit remote control, the $300 GXTV is definitely in your face. Samsung: 800.767.4673; www.sosimple.com*

BLINDED BY THE LIGHT? *Don't be blind to the effects of prolonged exposure to computer screens. Eyestrain is just not conducive to productivity. Enter Computer Eye Wear, makers of Q-Glasses. Using a proprietary algorithm, Computer Eye Wear calculates what power is best suited for prolonged monitor viewing and adds special tints and coatings to prevent ocular stress. For those of us who are already four-eyes, the next product on the company's roster are Q-Clips—"intended to enhance the contrast of the monitor and reduce glare, making it more comfortable for eyeglass wearers to use the computer." Currently, low-power samples of the Q-Glasses, intended for potential investors who'd like to check out the specs in detail, are available for $49.95 plus shipping and handling. Computer Eye Wear: www.compeyewear.com*

SPOOKY STUFF *Some examples from the unofficial Central Intelligence Museum web site: a Cigarette Package Incendiary Device—insert the cigarette filter-down for a two- to ten-minute delay before it ignites the gunpowder mixed with flake aluminum and plastique. Itch-Flock Disseminating Pen-Gun—"Firing the pen into an air-conditioning return-vent will increase the coverage considerably." Keep this in mind though: "The objects displayed here were originally fabricated (as props for the photo-graphs) according to technical descriptions and/or schematic drawings of equipment allegedly produced by the Central Intelligence Agency's Office of Technical Services, though some more recent works are but plausible fictions." Sure they are. The truth is out there, but the prices of these goodies are classified. Central Intelligence Museum: www.inch.com/~dna/CIMWelcome.html*



INTERNET FROM THE AIR *Wireless T1? Believe it. Starting in the year 2000, Stratospheric Telecommunications Service will launch at least 250 balloon-style geostationary Sky Stations, approximately 50x50m, to a height of 20km to 30km in the sky with enough power to support 400,000 simultaneous 64Kbps and 1,000 multi-megabit transmissions. How much for the fat, but fiber-free, bandwidth? "We estimate that 64Kbps Stratospheric Internet channels will cost less than the least expensive mobile communications service, about a few cents per minute," the company says. They're serious. Sky Station International: www.skystation.com*

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The Gaming **Apocalypse** is Coming

AND **VIC TOKAI** IS ONE OF THE **HORSEMEN**

I've seen the future of PC gaming, and it looks pretty much like the past... with better light sourcing.

For four days the computer entertainment industry moved to Atlanta for the Electronic Entertainment Expo to show its latest and greatest wares to distributors, store buyers, and media weasels. For all the trashy booth bimbos vying for your attention, for all the loud music, for all the flashy lights and outrageously expensive displays (OK, the giant Lara Croft was impressive), for all the cramped, loud, trashy parties, there was surprisingly little to raise the pulse in terms of what really matters: gameplay. To say that E3 showed an industry stuck in a rut would be an understatement: it's stuck in a rut with the wheels off the wagon, and the Indians swooping down from the hills.

The irony is that while games look better than ever, content is growing more and more derivative. The best-looking title was *Prey* (which will not crest until late 1998), and it's just another first-person action game with great graphics.

The next two years will be particularly rich for sims with *Longbow II*, *i688*, and *F-15* from Jane's; *Flying Nightmares 2* from Eidos; *iF-16*, *iF-22*, *i44 Panzer*, and *Warbirds 2.0* from Interactive Magic; *Red Baron II*, *Pro Pilot*, and *X-Fighters* from Sierra; the awesome *F-22 Air Dominance Fighter* from DID; and (if MicroProse can get it together) *Falcon 4.0*, *European Air War*, and *M1 Tank Platoon II*. These look largely superb, with developers working toward more complex physics models, truly dynamic mission structure, and native head-to-head play. These are the areas of remaining growth, and I really can't complain about where this genre is going.

The rest of the picture isn't so rosy, and the culprits are the real-time strategy game and the first-person action game. There were possibly two-dozen (I stopped counting) staggeringly repetitive real-time *Command & Conquer*-style games. Enough is enough. Even the good looking ones, such as *Dark Reign*, bore me to tears. They all blur into one another, and, despite what marketing toads think, fans will get fed up with them—and faster than they did with first-person action games.

As for *that* genre, expect more of the same from all the usual culprits and some people who shouldn't be doing it at all (who told Megamedia it should do 3D games?). Ion Storm's *Daikatana* is OK, but *Quake II* and *Hexen II* actually look better than expected. *Unreal* is fine, but didn't blow my doors off. Seamus Blackley of Dreamworks showed me what he had of *Trespasser*, and it was precious little: the expected ground-breaking physics modeling, a decent graphics engine with outdoor terrain (and no 3D acceleration), and a few objects.

Cryo showed it was back in form after some notable disasters (*Raven Project*, *Aliens*) with the trippy *Dreams... to Reality*, which looks like *Tomb Raider* with actual gameplay. The best adventure games were Interplay's *Star Trek: The Secret of Vulcan Fury* and Westwood's *Blade Runner*. Their computer-generated character animations are ground-breaking. A handful of strategy games look interesting but familiar: *Age of Empires*, *Sid Meier's Gettysburg*, *Close Combat 2*, *Jagged Alliance II*, and *Populous 3*.

Sadly, little else was promising. Vic Tokai is back, which is one of the signs of the Apocalypse.

The various online gaming services proved they're not sure what the future holds and how pricing schemes will wind up. VR-1, makers of the online game *Fighter Ace*, won the Dubious Venture Award for showing us (behind closed doors), a text-only RPG that was essentially a MUD with sound effects. I kept saying, "This looks like a MUD. These are free all over the net." And VR-1 kept saying, "Yes, but we think the sound effects give that extra added dimension. You can actually hear the noise of the crowd when you enter a bar." Uhhh, sure, I'll get back to you.

Granted, there were positive trends. The era of the Macromedia-made *Myst* clone seems to have faded. And with the notable exception of Southpeak (which seems determined to become the new Digital Pictures), FMV games were blessedly scarce. Corel doesn't have any new games, American Laser Games is out of business, and chances for a *Battlecruiser II* are slim. These are all good things.

Obviously, I'm ambivalent about the new crop of games. The technology is accelerating faster than our ability to use it creatively. It's as if the advent of the 3D card means that people can add colored lights and claim they're moving computer gaming forward. Next year will be one of "been there, done that, sold it to my cousin" games with increasingly absurd hardware requirements. The kid who liked playing with the box instead of the toy that was inside will probably be very happy. The rest of us will have to wait for this industry to grow up. b

T. LIAM MCDONALD is the all-knowing god of gaming. His mother still can't believe that he plays games for a living.

To say that **E3** showed an industry **stuck** in a **rut** would be an **understatement**: it's stuck in a rut with the wheels off the wagon, and the Indians **swooping** down from the hills.

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WITH SHEL KIMEN

Mars **Attacks** the Web

IT'S THE **BIGGEST** INTERNET **EVENT** YET

It makes sense that the latest attack on the Red planet would launch from the web.

I'm not speaking of the little green men who graced last summer's graphics-whiz-bang blockbuster, *Mars Attacks*. I'm referring to the MacDonald Douglas, NASA, and Jet Propulsion Labs mission to Mars that landed July 4th, 1997. (How charmingly American...) Since I'm writing this before the landing I have no way to calculate whether it was successful, but here's how it goes.

December 1996: MacDonald Douglas launched a rocket affectionately named the Delta 2 from Cape Canaveral, Florida. The rocket contained the Mars Pathfinder capsule. Seven months and 500 million kilometers later, the rocket, now diminished to a small craft, approaches Mars. When its speed slows to 1500km per hour, a parachute opens and the craft inflates airbags 5 meters in diameter.

The lander will automatically open using solar power from the rising sun (it's landing at night so it won't be seen by Martians no doubt.) The sun will activate the camera, which sends panoramic shots back to Earth. After NASA and JPL view the photos, the rover sets forth to cruise the planet's surface.

The rover is 45cm in width and 60cm in length. It weighs a total of 11kg and has been designed to crawl over rocks. If the rock is too big, the rover goes around the rock. If it finds a rock it likes, it deploys its "Alpha Proton X-Ray Spectrometer" to take a data sample for processing by scientists back on Earth.

The rover will be sending live data feeds to a control room in Pasadena (with a 10.5 minute delay for signal travel). What makes this journey especially interesting is that the data will be converted dynamically (on the fly) to a VRML world, and broadcast on the web. Anyone with a VRML browser should be able to see the rover and its path along the Martian terrain. There is also an animated model of the rover landing, fully explorable, with "lots of big buttons" said David Pomfret, aerospace solutions manager for Silicon Graphics. He built most of the VRML for the event. "I wanted it to be as easy for an 8-year-old to understand as it would be for a post-doctoral scientist from Europe who didn't speak English."

Normally, such an event would mandate that CNN, NBC, and the other networks run special reports before, during, and after the landing. They would show captivating interviews with all the project participants, and certainly the President. They would play dramatic music and trace the liftoff and landing with magnificent special-effect graphics. And they would show maybe 60 seconds of live data for us gawking consumers. If you were lucky enough to be glued to the set for that precious 60 seconds, you might see a pixelated version of Mars from the prescribed Ted Turned angle. If you missed it, you'll get a worse picture on the cover of *The New York Times*.

Well, victory for the rebel forces is at hand. Now you can see the news for yourself (if you have a Pentium and an Internet connection that is) anytime you want. Not only will it broadcast live, but the archives will stay online on mirror sites across the world. You control what news you see and when. The super bonus is you get to see it in 3D, just as the rover sees it. As data is reported and the archive is built, you will also be able to explore the surface of Mars yourself—and not just following the rover's path, but using your own virtual rover to scope out the virtual terrain built from the data. You can see some of the VRML models at **vrml.sgi.com/worlds/rover/**.

"This is a monumental scientific event for mankind and VRML is doing something television can't do," said David Frerichs, VRML product manager for Cosmo Software, wholly owned by Silicon Graphics. "It's delivering the true promise of the web—the proactive mass accessibility to important global information."

If you don't have a VRML browser, there's still plenty of Internet activity scheduled for you. The sites listed below will feature updates on mission activities, provide Pathfinder photographs, and also feature a bird's-eye view of the Pathfinder mission operations area via a live video camera feed that is updated every 15 minutes.

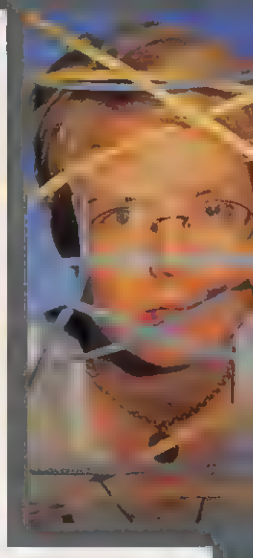
"We're expecting a siege of hits on July 4," said David Dubov, Mars Pathfinder webmaster at JPL. "Our best estimate, based on past events such as Galileo, the Comet Shoemaker-Levy 9 collision in 1994, Comet Hale-Bopp's return, and other celestial events, has led us to plan for at least 25 million hits on July 4, and a similar level of hits per day during the week following landing."

Hit a mirror closest to your town for best access.

Realize that there will be a window of delay just in case the rover finds something we "shouldn't" see, but the web can't do everything. At least we won't have to listen to Connie Chung or Larry King's effervescent babble.

PUBLIC SECTOR MIRROR SITES: NASA Ames Research Center, **mpfwww.arc.nasa.gov**, load capacity: 5 million hits per day; National Center for Supercomputer Applications, **www.ncsa.uiuc.edu/mars**, load capacity: 4 million hits per day; Cornell Theory Center, **mars.tc.cornell.edu**, Load capacity: 4 million hits per day; National Center for Atmospheric Research #1, **www.mars.ucar.edu**, Load capacity: 4 million hits per day. b

As **data** is reported and the **archive** is built, you will also be able to **explore** the surface of **Mars** yourself—and **not** just following the rover's **path**.



SHEL KIMEN
(kimen@well.com) has spent more time online than is reasonably healthy for one person and dreams in hypertext

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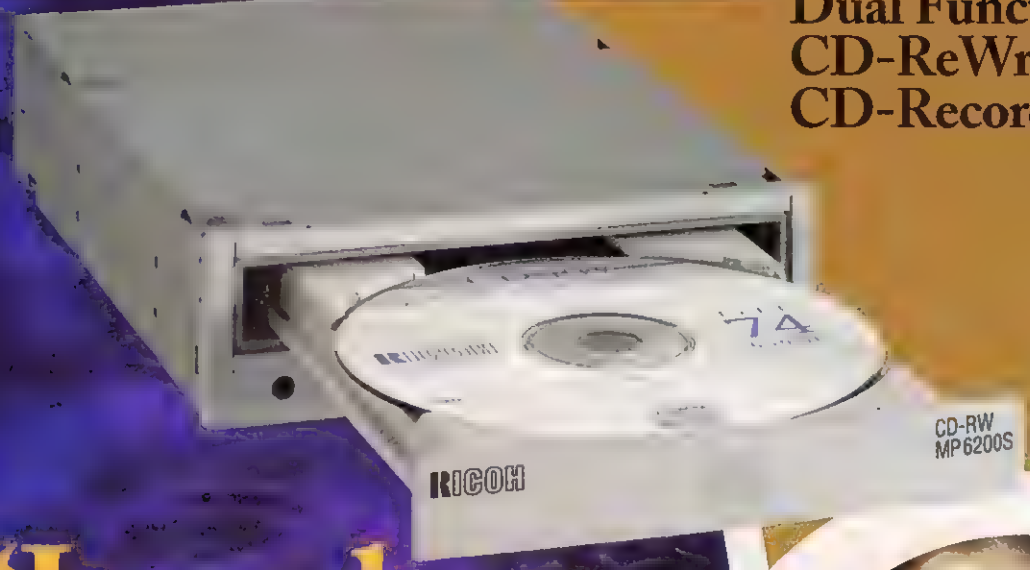

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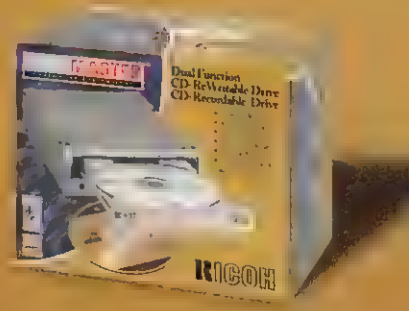

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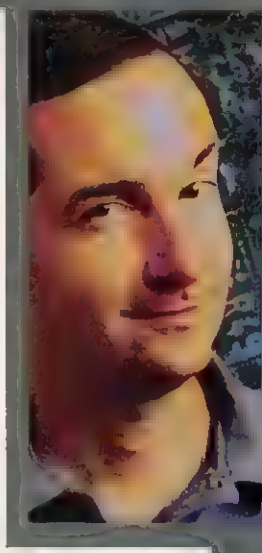


TOM HALFHILL is a senior editor at *Byte* magazine and the author of two computing books. He first became interested in computers during the disco era.

About 15 years ago, someone asked me what it would take before practically everyone owned a home computer. "That's easy," I joked. "It'll happen when home banking turns your computer into an ATM so you can withdraw cash. Then everybody will want one."

Of course, I never seriously thought a home computer could issue cash like an ATM. Until somebody invents a *Star Trek* transporter, some things (like $20 bills) just can't be digitized, downloaded, and reconstituted in their original form.

But guess what? It's about to happen. And I predict it'll be the long-awaited "killer app" that pushes personal computing to the next level.

My joke won't *literally* come true—your color inkjet printer won't print money. (Not *legally*, at least.) Instead, the cash will arrive from your bank account as bits that your computer will store on something called a smart card.

A smart card looks like a credit card, but it's really a tiny computer containing a microprocessor, RAM, ROM, EEPROM (Electrically Erasable and Programmable ROM), a serial I/O interface, an operating system, and strong crypto software. Incredibly, some smart cards are more powerful than my first computer in 1981.

Smart cards are almost unknown in the United States, but that will change fast. Worldwide, they're a $1 billion market. A French company called Gemplus manufactures about 1 million smart cards each *day*. They're accepted by public pay phones, banks, and insurance companies. They can work like debit cards, or as secure identification cards for gaining access to restricted computers, networks, and services. One of my colleagues in Germany carries a smart card that stores his entire medical record.

Some businesses control access to their computers and networks by issuing smart cards to employees. Users log on by inserting a smart card into a special reader. The computer verifies their identity and restores their customized desktop environment just as they left it from their previous session.

Today, smart card readers for PCs are usually external devices that plug into a serial port. It won't be long before smart card slots are a common feature on PCs. You might not even have to buy a new computer. A U.K. company (Fisher International) recently introduced a smart card reader called the Smarty that looks like a 3.5-inch floppy disk. With this clever device, almost any PC can read a smart card. Simply insert a smart card into the Smarty, then stick the Smarty in your floppy disk drive.

In Germany, a Stuttgart-based company called TeleCash is using the Smarty to bring its electronic payment service to the Internet. The service, called MoneyBytes, will work with a Java-based payment server and the smart cards issued by Zentraler Kreditausschuss, a German banking association. In effect, it turns any PC into a TeleCash ATM terminal.

Why is this important? Let's say it's midnight and you need a loaf of bread and a gallon of milk. (OK, make it a carton of cigarettes and a bottle of tequila.) You're short on cash. Do you really want to withdraw money from an ATM on a dark street and risk getting mugged? Not if you're a power user, you don't. Thanks to your nifty smart card and your trusty PC, you can download some cash in the safe comfort of your home, then go to the store and get mugged there.

Seriously, the real benefit of smart cards isn't in late-night runs to the convenience store. It's in what you can buy online: electronic commerce will get real. Smart cards use strong encryption and authentication software to verify your identity and protect your transactions. If you feel comfortable using checks and credit cards, you'll be even safer using a smart card. It's not like they're untested technology—smart cards are widely used in Europe today.

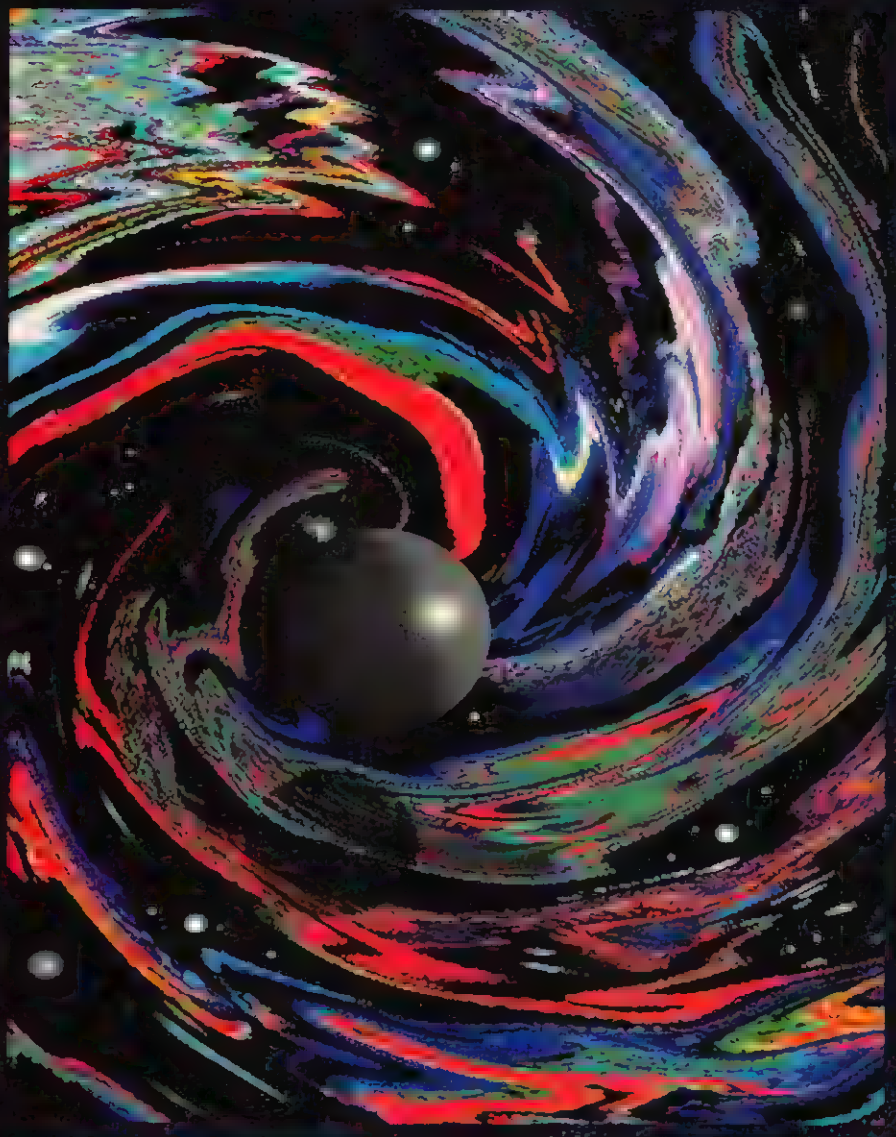
Home shopping is a huge business. Each year, in the United States alone, people order more than $50 billion of merchandise from mail-order catalogs and more than $2 billion of stuff from home-shopping channels. The next frontier is the web. It's more interactive and it can dramatically cut printing and mailing costs for retailers. The only obstacles are that most consumers don't have a computer and haven't been exposed to this form of shopping before.

Will millions of average folks rush out to buy a smart card-enabled PC so they can shop on the web? Some experts think so. Intel wants everyone to buy a $2,000 Windows PC so it can continue to sell Pentium chips at a hefty profit. Microsoft wants everyone to buy a $2,000 Windows PC so they'll have enough power to run the latest bloatware. But in my not-so-humble opinion, anybody who thinks the PCs that you and I use are suitable for the real mass market is insane.

What is going to happen is the convergence of the web, online commerce, and the consumer market will force the industry to produce new kinds of computers that are more affordable and easier to use. They may not be as powerful as the PCs you and I own. But it doesn't matter, because they won't replace conventional PCs—even though, eventually, they'll probably be more popular.

Next month, I'll describe what form those new computers will take, and why someday you might want to buy one in addition to the PC you have now.

A **smart card** looks like a **credit card**, but it's really a tiny computer... I **predict** the smart card will be the "killer app" that **pushes** personal computing to the **next level**.



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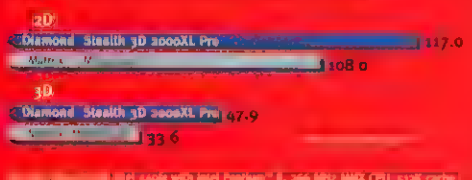

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How To Get Fired From Microsoft

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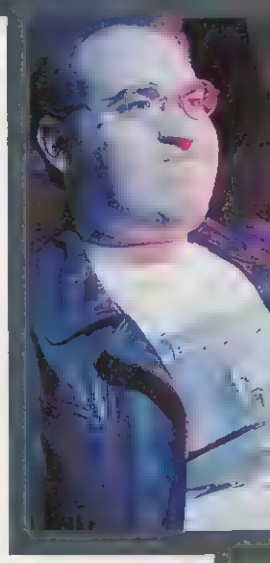


ALEX ST. JOHN From his position as Microsoft's game technology evangelist, Alex St. John was responsible for the controversial DirectX APIs that have either taken PC gaming to the next level or were horribly broken, depending on your point of view

June 11, 12:15 p.m. Precisely four years and five months after joining the empire, security escorted me from Microsoft Building 5. Being fired came as no great surprise. I'd certainly been doing all the right things to warrant an abrupt dismissal. Although Microsoft rarely fires anybody, I was pretty sure when I issued that final e-mail that they would be my last words as a member of the collective.

As I typed the fatal response—to an e-mail from Paul Maritz insisting that I apologize to Deborah Black for essentially calling her an idiot in an earlier piece of mail—a fellow evangelist came by, looking like he'd just been carjacked. He had independently responded to the same stupid action just minutes ahead of me and I told him not to send e-mail like that if he wasn't prepared to get fired for it. Although I had sent plenty of these in my time, each time I hit the Send button I fully expected termination as a possible consequence.

I'm somewhat of an expert on getting fired from Microsoft, because I certainly tried everything I could think of.

I also got around enough to encounter the gamut of incompetent fools intimately intertwined in a vast organization of otherwise pretty smart, motivated people. Most departments keep a few duds around to satisfy the Microsoft review curve. There are lots of academics whose area of expertise is so esoteric that nobody is capable of comprehending them let alone evaluating them. When you have a few billion in the bank, nailing down all the IQ in the industry—even to do nothing—has the beneficial effect of preventing them from doing something productive for a competitor.

For my part, I tried blowing the department budget for the entire year, helping ISV's port Win95 games without anybody's permission. There was the BunnyGate scandal at last year's CGDC, and then I torched over $3 million dollars building a stadium-size spaceship inside the Alameda military base for an event my department's new management canceled. Mind you, I handled the ensuing hostage situation with minimal repercussions in the media, but I still thought I was done for on that one. Then there was the time I gave those Sega executives a Humvee ride through the new Microsoft construction site. That may not have made an entirely positive contribution to the company image. Sure, some people appreciated the humor of roaring through the parking garage on my Harley to set off all the car alarms, but I can understand the feedback that it was not professional behavior. Once we did utterly destroy a conference room in a massive Chinese food fight, but that was to be expected after shipping the first version of DirectX.

I expressed my opinion of the Talisman project in ways that may not have been regarded as entirely productive criticism.

> Once we did utterly **destroy** a conference room in a **massive** Chinese food **fight**, but that was to be **expected** after **shipping** the first version of **DirectX**.

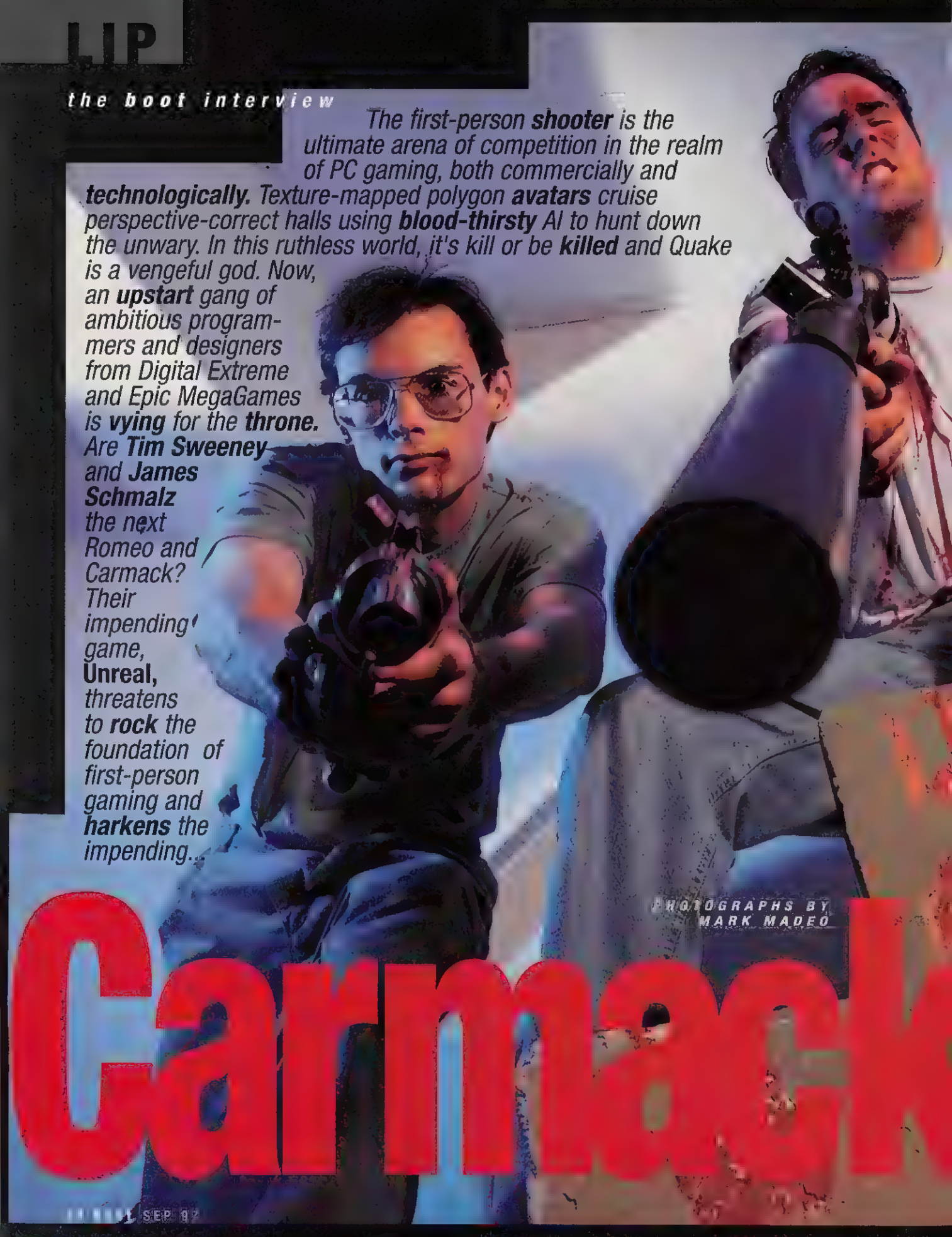
Nevertheless, for all that time, I continued to draw salary and amass stock options. I began to wonder if the fabled "Microsoft firing" procedure actually existed. Rumor abounded about how it worked. I'd heard that while your manager was delivering the fatal news in his/her office, and requesting you turn over your security card, credit card, phone card, cell phone, pager, and Pilot PDA, MS Security would be down the hall, in your office, removing your computer. When finally summoned, I left some Hershey kisses out for them, but I'm told they weren't eaten. Security people have no sense of humor. I brought a shiny red Apple to Morris, my hatchet-man manager, that day. I figured that if he ever got interviewed for firing me, he'd need a good anecdote to tell. I always loved that scene from "Real Genius."

The meeting was brief and to the point. Morris had me escorted from the building. My strongest sentiment at the time was being chagrined that the security guy was half my size. I was thinking, If I go postal, I could swat this guy like a fly, and probably kill most of PR and marketing before they bring me down. Then it occurred to me: maybe they were hoping I'd do just that.

After a couple of weeks of riding my Harley around Montana and scuba diving in Canada, I went to visit my family in Maine. I was sunbathing nude on some rocks at the base of a cliff in Camden when Todd Neilson, Morris's boss, called me to discuss closure on some remaining issues. I recommended that he get himself fired and come have some fun too. Just then a middle-aged couple and their teenage daughter peered down over the cliff at my naked body. I choked mid-sentence. I explained my sudden loss for words. Neilson hasn't called me since then.

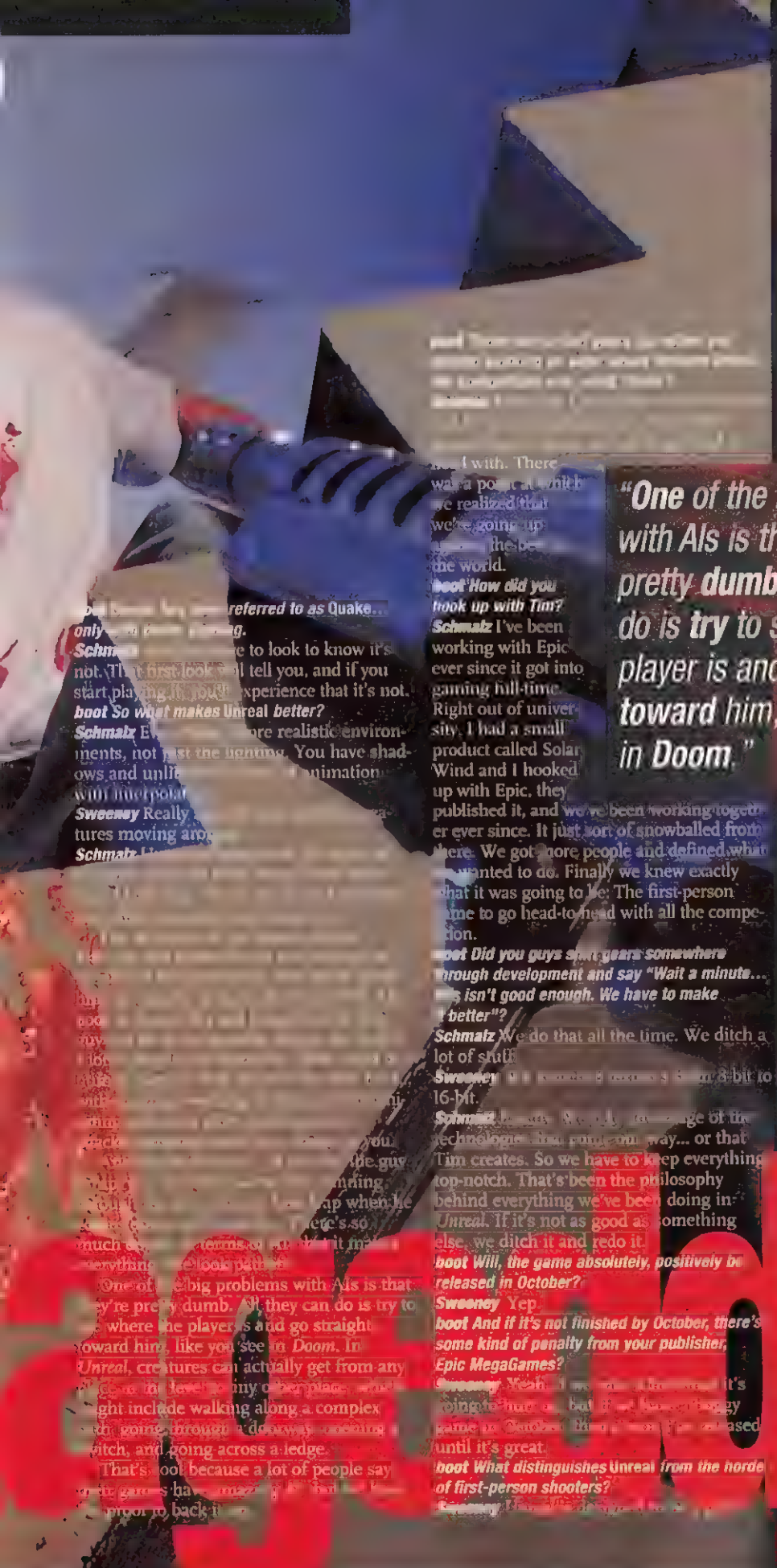
When I got back, the prospect of being a wage slave held no appeal, but then the folks at *boot* made me an offer I couldn't refuse: to write long rambling columns about my adventures at Microsoft in exchange for some pocket change and a really nice notebook. How could I say no?

The first-person ***shooter*** *is the ultimate arena of competition in the realm of PC gaming, both commercially and* ***technologically.*** *Texture-mapped polygon* ***avatars*** *cruise perspective-correct halls using* ***blood-thirsty*** *AI to hunt down the unwary. In this ruthless world, it's kill or be* ***killed*** *and Quake is a vengeful god. Now, an* ***upstart*** *gang of ambitious programmers and designers from Digital Extreme and Epic MegaGames is* ***vying*** *for the* ***throne.*** *Are* ***Tim Sweeney*** *and* ***James Schmalz*** *the next Romeo and Carmack? Their impending game,* **Unreal,** *threatens to* ***rock*** *the foundation of first-person gaming and* ***harkens*** *the impending...*



PHOTOGRAPHS BY MARK MADEO

Carmack



"One of the big problems with AIs is that they're pretty dumb. All they can do is try to see where the player is and go straight toward him, like you see in Doom."

engine rather than a specific game. A large amount of the code is the *Unreal* engine, and then there's a separate large chunk that's the game itself. This means we can do a project like *Unreal* and then add some technology and start a new game without a gigantic hack job. The engine's going to be useful for others who want to do 3D games.

The engine itself is based on a little programming language I set up called *Unreal* Script. It's great for our own development because it means our programmers, and even some of our level builders, can go in and write scripts. A good script might control a monster and you say "This monster's purpose is to guard this specific artifact and when the player attacks him, he should use these particular strategies." When we release the game and the editor, people will be able to build their own levels and then write scripts to control everything, which creates plenty of possibilities. You'll see a lot of people who have learned to program using *Unreal* scripts because it's an easy language and it's convenient.

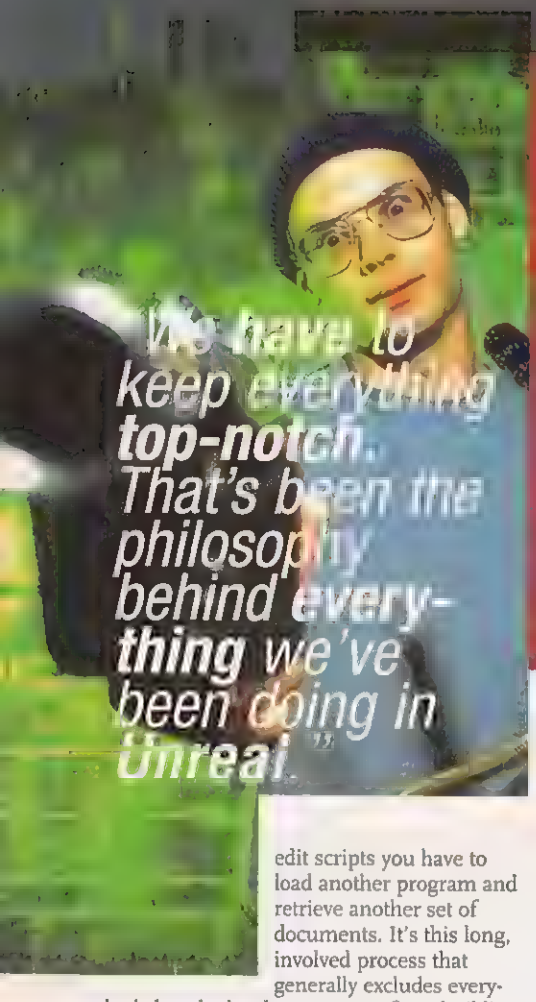
Unreal's editability is going to be its defining characteristic in the long term. When you see people buying *Unreal* three years from now, it won't be because we made it such a great game initially, it will be because the game was expandable enough that the community developed around it and was able to do cool stuff with it.

***boot* Do you think Unreal's editability will dilute the game in any way?**

Sweeney No, it will be complementary because it will take people awhile to catch up to the quality of our levels, but *Unreal* will be the ultimate platform for building and playing 3D game levels. So if they kick us out of the level-development business, great!

Schmalz The editor just makes it so easy. It will bring level building to the masses.

Sweeney We were looking at what it takes to do a *Quake* level. It's, see... the simplest way I've found is to go to five different web sites, download an editor, then download the documentation from somewhere else, download the texture from somewhere else again. Of course, you have to wait for everything to download. Then go to another web site for instructions about what to do. Then install the editor and install the textures, set up all the directories, and run the editor. Then you can *maybe* build some levels if you can figure it out, because there's no online help. And then you have to run some other command line utility to rebuild the level if you want to



edit scripts you have to load another program and retrieve another set of documents. It's this long, involved process that generally excludes everybody but the hardcore gamers from building their own levels.

But with *Unreal*, there will be Unreal.exe—which you run to play the game; Unreal Edit—which you run to edit levels. You can load up all our existing levels and make minor changes to an existing level, or start building your own thing. It's pretty much a few mouse clicks away from home.

Schmalz It runs the level for you right there without plugging in the editor.

Sweeney Yeah, and that will be the crucial component for Internet-based gaming. All these people will be setting up *Unreal* servers, and unless we have a good editor out there, you'll end up with a thousand servers running the same levels. HTML would never have taken off if it wasn't so easy to edit, because nobody would be able to build a web page. *Unreal* Edit is the same way with Internet 3D games. It's like a real-time 3D studio.

Schmalz It is real-time. You move the light, you see the light emitting into the world and how the shadows fall... you place the monster, you can see exactly how he looks, where you're placing him. All you've got is the window there, and you're placing it within the window and everything is rendered, dynamic lighting and everything... it's very easy to use.

***boot* So the proliferation of levels is a sign of success?**

Sweeney Yeah, it's like Netscape. They're in the business of selling browsers. We could be in that business too, but since we're creating the coolest game levels and content, we're going to have a really big business selling *Unreal* and its sequels, future games, and level packs.

Schmalz More complicated things such as textures, creatures, and stuff like that are not as easy for the average person to create. That's the stuff that people want—and new brushes. If you're putting together a cool level and the average person wants to do it, we can supply them with all these hallways or new configurations or give them these add-ins that can help them create their worlds.

boot* How realistic is Unreal *right now?

Schmalz Extremely.

Sweeney *Unreal* is the most realistic 3D game environment you've ever seen on a PC.

boot* How does the Unreal *engine beat the World-in-the-Box model of games such as* Quake *and* Duke*? Is there an unlimited environment in this engine?

Sweeney Yeah, we've been experimenting with things like terrain in outdoors areas, but it's not all in the engine set—it's hard to say what's going to make it in the final release. The big limitation I've found with games such as *Duke Nukem* 3D, *Doom*, and *Quake* is that you run through this great, interesting, beautiful level, then you get to the end and you hit a switch. End of level. You have to start the next level and you just keep going in this big linear path. In *Unreal*, everything is connected and it feels more like an environment. You don't feel like you're in Level 3; you feel like you're in this big world that you're part of.

Schmalz Each level is a discreet area, but they'll give the appearance of everything being totally connected, so you won't feel like you're in one little area. We're hoping to allow elaborate multiplayer games on the Internet, with sprawling connected network servers. You could have this massive world where you jump from one server to another, which, halfway down one hallway, teleports you to another server in an identical hallway. It appears totally seamless, but you're jumping from server to server. This could potentially be hundreds of servers across the world, all connected in this great big world of *Unreal*... potentially.

Some people will set up their own subcultures within that and defend their server. If some guy wanders onto their server, there could be a huge battle. We don't have the resources to build something that huge, but we're hoping the public takes it and runs with it and makes this really awesome massive world of *Unreal*.

***boot* How important is scalability to new hardware in terms of the engine?**

Schmalz It's really important because we definitely want to be making games with the *Unreal* engine in the future. Developing an engine from the ground up takes a huge amount of time, probably six man-years of effort, minimum. So the technology really has to be scalable, otherwise you're spending an awful lot of time developing and won't have much to show for it.

3D hardware will improve much faster than developers can write engines to support it, so your engine has to grow with the hardware, and take advantage of new capabilities without rewriting it from the ground up.

***boot* Rank the various 3D engines.**

Sweeney Well, the *Doom* engine woke consumers up to awesome 3D games. It's the best possible engine going on a 486. That was the major breakthrough that opened up 3D gaming on the PC. The *Quake* engine was a huge improvement, but it also had limitations. Some things were worse than *Doom*, such as lower-resolution textures and the polygon limitations, so it was like three steps forward and one step back. That's why *Quake* wasn't the huge breakthrough that *Doom* was.

BUILD was a solid improvement over the *Doom* technology, but it's outdated and developers have moved on. *Quake* is really becoming outdated. It depends on what *Quake* 2 does and whether they move the technology forward.

Schmalz I expect *Quake* 2 to be pretty impressive... when it comes out. We haven't heard much about it, but Carmack should come out with something pretty good, and it would rank number two behind *Unreal*.

boot* Unreal *will follow the* Doom, Quake, *etc. model by distributing the first level as shareware. How important are these demos?

Sweeney They are crucial. That's where the player decides whether they want to buy it or not. It's been a good thing for the industry because it's reduced the number of bad games consumers buy.

Word Association

boot *Let's do a word association thing. Just say the first thing that comes to mind. First off: Tomb Raider*

Sweeney This sucks.

boot *You say it sucks? Why?*

Sweeney Oh, no. I said the word association thing sucks. Tomb Raider [illegible] I really like the graphics. The feeling of being [illegible] they really nailed it. The animation is spectacular.

Schmalz The [illegible] good [illegible] from other 3D games.

boot *What do you think of* [illegible] *from what you've seen?*

Sweeney What I've seen looks really cool. It makes good use of colored light and radiosity.

Schmalz Yeah, it's definitely going to be a great game. [3D Realms] will take the time to make a good game [illegible] when it comes out.

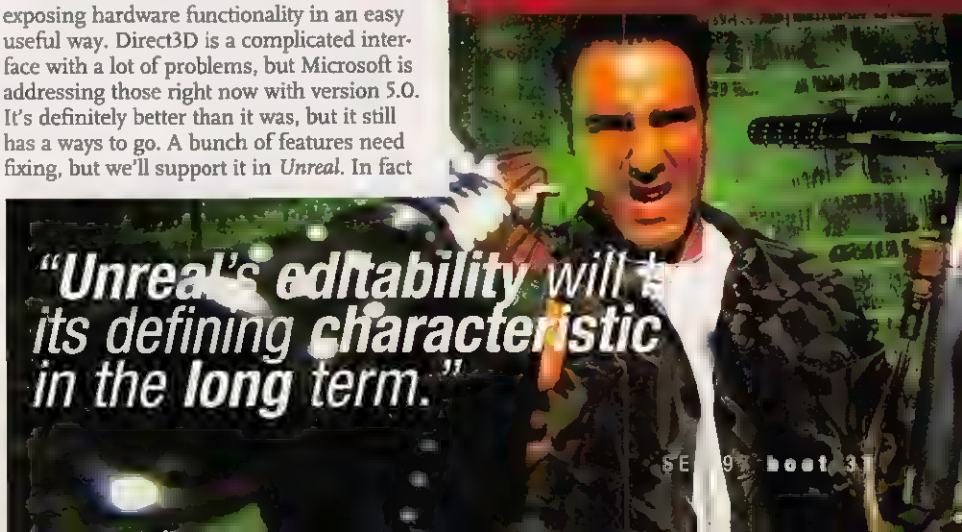
Schmalz We show everything we've got for free and if it sucks, people won't buy it...
Sweeney You learn pretty quickly that you have to make good games.
Schmalz Yeah, that's one of the reasons why id and Apogee and 3D Realms and ourselves are doing such great things now, because we were forced to make good games. If you make bad stuff, you can't put it in a fancy box and expect to make money. It goes out there and if it sucks, it doesn't sell, and you lose money.

Retail game companies have a really bad feedback cycle. There's not much correlation between the quality of the product and sales, which is a sad situation. The companies that have definitely been growing the most over the past few years all come from a shareware background. The whole shareware industry was pretty much launched by Scott Miller when he started Apogee and put out some shareware games. He defined this model where he put out a small part of the game and then sold the rest of it to consumers. That works.
Schmalz Yeah, because if you suck, you die.
boot What's the worst game you ever bought?
Sweeney There have been many. In fact, if you pick up a game from a retail shelf, you have a 90 percent chance that it will suck.
boot Does it bother you that a lot of games don't cut the mustard?
Schmalz We don't care at all. People who are into games know.
Sweeney It's a really inefficient situation where a lot of publishers spend a lot of money to develop a lot of crap that doesn't sell and they discover, "Gee if we put out a smaller number of really high-quality games we make a profit. If we put out a large number of crappy games, we don't." Once that's realized, more of the profits are reinvested in developing good games rather than being sunk into speculative projects that don't turn out well.
boot Didn't 3D Realms approach you about using the Unreal engine for Duke Nukem Forever?
Sweeney At one point GT saw *Unreal* and suggested we talk to 3D Realms. So we showed them our stuff. It turns out that they were considering *Unreal* for *Duke Nukem Forever* and wanted to get it out for the first quarter. We looked at it realistically and both companies concluded that they'd have a much better chance of doing that with the *Quake* technology. They would have ended up with a better game if they had used *Unreal*, but it would've added at least another two or three months to the development cycle because the technology wasn't finished. But they're a cool company and we'll be looking at future stuff with them.
boot Who is licensing the Unreal engine?
Sweeney Right now our only licensees are Spectrum HoloByte, GT Interactive, and Legend Entertainment. We've talked to five times as many companies who are interested, but it's all under NDA. Right now, we've been hesitant because it's a lot more work supporting licensees before the technology is finished. For now, we just want to work with a very small group of really talented people such as Spectrum, people who can take on an unfinished technology and do something cool with it.
boot What's Spectrum doing with the engine?
Sweeney They've announced two *Star Trek* games and they have one other non-*Star Trek* game, a first-person action-oriented game in the *Star Trek* universe.
boot When are those games slated to ship?
Sweeney I believe starting third quarter '98.
boot Do you care what kind of games people develop for the engine?
Sweeney The only thing we really care about is that they be developing really good games. We looked at the teams doing projects and they're all top-notch. But Spectrum was especially attractive because it has the *Star Trek* license and we see that as something that's complimentary to *Unreal*. People aren't going to choose between buying *Unreal* or Star Trek games. The real gamers will still buy *Unreal*, and *Star Trek* fans will buy that. They're not making *Unreal* clones; they're making their own unique cool games.
boot Are you afraid of Unreal clones?
Sweeney Not if they're using our technology!
boot What do you think of Microsoft's push into gaming?
Sweeney It's good. By developing stuff themselves, they'll learn that they're going to have a hard time making DirectX a good game API.
Schmalz If they help us with the tools—all the better for us.
Sweeney If I were GT or Electronic Arts, I'd be very worried about Microsoft.
boot DirectX is very controversial among 3D game developers. How do you feel about it?
Sweeney It's good for gaming in Windows, very good. I've been using almost all of the DirectX interfaces: DirectDraw, DirectSound, DirectPlay, and Direct3D... they're well-designed and useful. Overall, it's a positive thing for gaming.
boot What are DirectX's greatest weaknesses?
Sweeney I'd say Direct3D has been the most controversial, but it's the weakest in terms of exposing hardware functionality in an easy useful way. Direct3D is a complicated interface with a lot of problems, but Microsoft is addressing those right now with version 5.0. It's definitely better than it was, but it still has a ways to go. A bunch of features need fixing, but we'll support it in *Unreal*. In fact that's the only way to get 3D games into consumers' hands once a wide variety of hardware companies have good 3D cards out.
boot What needs fixing in Direct3D?
Sweeney There's a whole bunch of 3D hardware features—some are available and some aren't—and you have to figure out which specific stuff is supported, and just use a certain number of texture formats and a certain kind of frame-buffer format. When you're developing for Direct3D, you need to test it on every possible piece of hardware that it's going to run on. And if you get Direct3D working on the first five pieces of hardware, then it's probably not going to work on the sixth one. It leaves all the work to the programmer, whereas I'd like a 3D interface with a wide array of functionality where everything works, and the only difference is performance. So it's optional—rather than mandatory as it is now with Direct3D)—to try it on every piece of hardware and fine-tune it for specific pieces of hardware.

Once we have a more stable lowest common denominator for 3D hardware, it will be less of a problem. Once we can assume that everybody has 3Dfx or better in their machine, it won't be so much work.
boot Is 3Dfx the minimum standard for good 3D cards?
Sweeney Yeah, I'd say 3Dfx defines the performance criteria. If everybody stuck to that and only improved on it, we'd be in really good shape. 3Dfx has a wide variety of stuff

Pay to Play

boot Why do so many games use big-name rock stars for their soundtracks?
Schmalz It sells.
boot Does it add anything to the game?
Schmalz If they're talented and they do great stuff. If it's a big name it might sell a few more boxes, but it doesn't add to the game unless the person is talented.
boot Who did the soundtrack for Unreal?
Schmalz Alexander Brandon.
boot And he is?
Sweeney Just pure talent and no big name.



that doesn't cost you any extra time. The thing that hurts other 3D accelerators the most is that each additional effect costs more time. You have regular pixelated texture mapping, then when you add bilinear filtering it's twice as slow... and then you do Z-buffering and it's twice as slow as that. Performance is too dependent on what effects you do. One of the neat things we're doing in *Unreal* is taking advantage of 3Dfx's ability to let you do all these effects at the same time with no extra cost. And so... you have shadowed texture maps all around and colored lighting and transparent surfaces, all kinds of things like that—and it's not costing you any extra time. If you ran it on a lower-end 3D accelerator it would be ridiculously slow.

boot ***Filtering vs. frame rate: Which is more important?***

Schmalz Frame rate is super important.

Sweeney Yeah, in a 3D action game you need frame rate first and foremost; and then you do all the cool effects. The nice thing about 3Dfx is that you can do bilinear filtering with no extra cost. But we had to design *Unreal* for lower-end hardware, so we'd just turn that off and get the speed up to the point where it's really fast and playable.

Once you're up to 35 fps, you start turning on options that increase the detail levels, but gameplay is most important.

boot ***Violent games such as Quake and Doom—and probably Unreal—have been characterized as being a bad influence on youths. Do you take personal responsibility for any of that?***

Schmalz We're making the game for people our age and we think parents have a responsibility to monitor what children play—just like with TV. The onus should be on the parents. Parents should teach their kids the difference between reality and fantasy.

boot ***People such as Sen. Joe Lieberman (D-CT) want to ban violence in computer games.***

Schmalz That's silly. Why target computer games?

Sweeney You can't take great games away from all people because they're not appropriate for little kids.

Schmalz We're fine with ratings; people 17 and under shouldn't be playing our game.

boot ***How old would your child have to be to play Unreal?***

Schmalz I wouldn't mind my child playing it at any age. It's a parent's choice: Some parents probably wouldn't like their 20-year-old kids playing something like this.

Sweeney It's like an R-rated movie. If you're happy letting your kids watch an R-rated movie, then they can play *Unreal*.

boot ***How much gore is too much?***

Sweeney *Doom* has great gore. It is realistic enough that you really feel like you shot this guy and blood went flying off him. And then you get to *Quake*... which kind of exaggerates it and *Duke Nukem 3D* is just silly. You blow up a creature and then five times his body weight in blood comes flying out and there are three eyeballs going off in all directions. That's controversial, but it's not realistic, and whenever you depart from realism like that, you lose the scary realistic atmosphere.

boot ***Would you consider including a brutal rape scene in a game?***

Sweeney If it made sense within the game environment, we would not be against doing a brutal rape scene. But if it's just gratuitous—Oh, here's somebody being raped—then, no.

boot ***The storyline in first-person shooters always plays second fiddle to the action. John Romero left id to have more control over storyline. How important is a game's storyline to you?***

Schmalz Gameplay is definitely number one. The story does play second fiddle to gameplay, but having a good setting, a good world, a good story to build around is very important, too. We had that right from the beginning and it allowed us to keep everything consistent.

Sweeney Otherwise you end up with a mishmash.

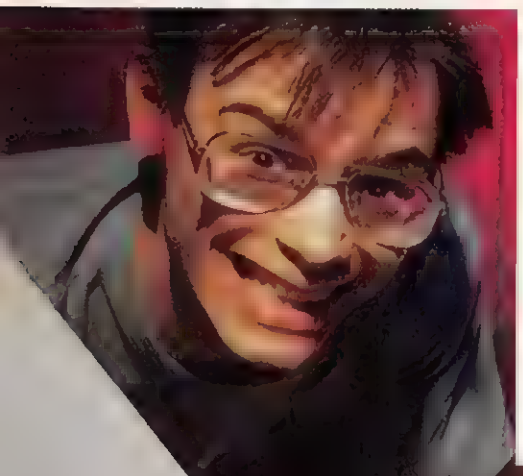
Schmalz [id] had that problem in *Quake*. They had the mishmash between medieval and... whatever, and you didn't know why and the story was bizarre. It's important to maintain cohesiveness. You want some sort of reason behind everything.

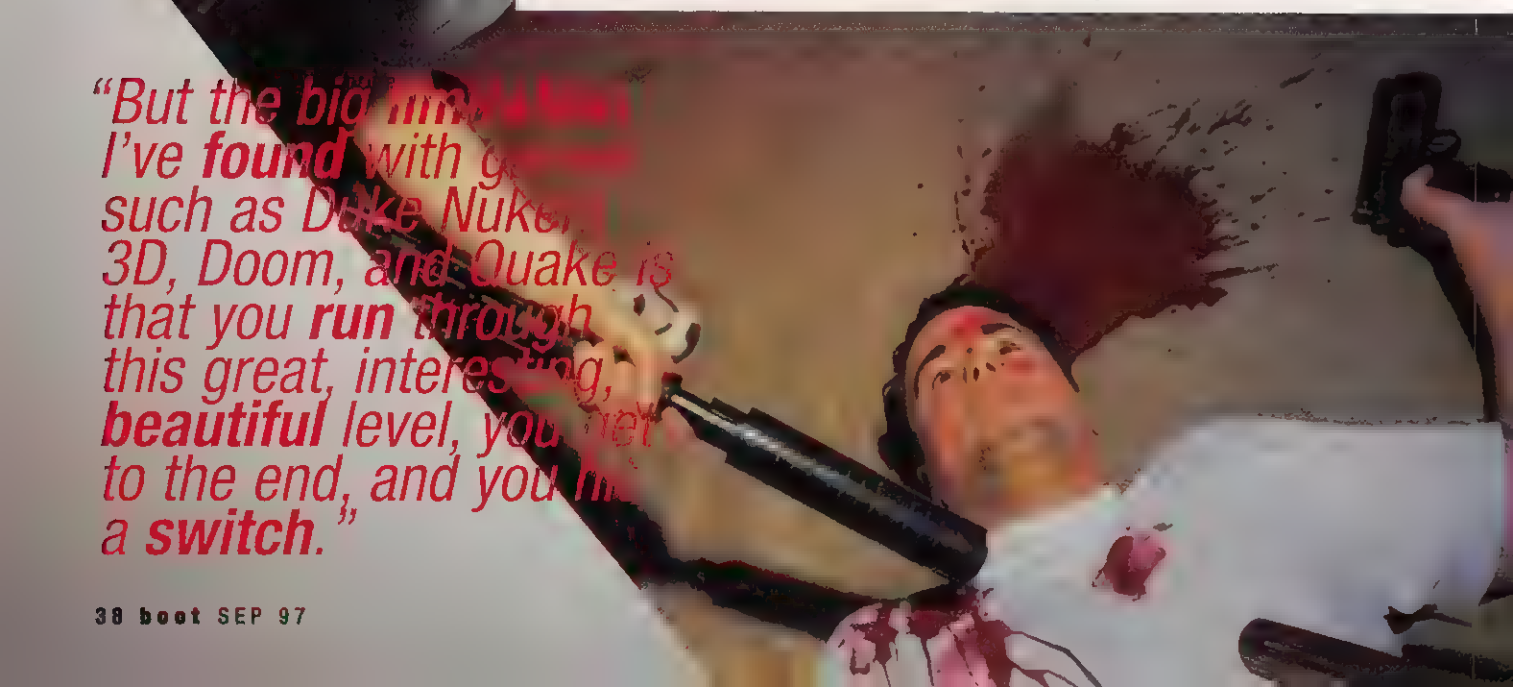
Sweeney There are actual stories that unfold as you play *Unreal* and the game's driven by the players. You want the players to tell the story. If you ask them "What's this game about?" you want them to say, "Well, I started out in this crashed spaceship, I explored this alien planet, and there were these two alien races warring there. I've been trying to get off this planet and there are these big bad aliens called the Scars, and now these peaceful guys are being attacked by them."

Schmalz Yeah, it'd be silly for someone to say "Here is the exact story" paragraph for paragraph as you walk through the game. It has to be flexible enough to allow a person to go around and build their own story.

Sweeney If we do a good job with our game design, the average person will be able to play *Unreal* and then tell the story without reading anything.

Schmalz We don't want to stop the action for anything. We have cut scenes, but





*"But the big [illegible] I've **found** with g[illegible] such as Duke Nuke[illegible] 3D, Doom, and Quake is that you **run** through this great, interes[illegible], **beautiful** level, you [illegible] to the end, and you h[illegible] a **switch**."*

Crossing Over

***boot* How many platforms is *Unreal* being developed for?**

Sweeney PC is the only one we're doing for sure. GT is talking to DMA about doing it on a Nintendo 64. We're also looking at this Microsoft arcade thing, but the PC is the only guarantee. And Nintendo 64 is very likely.

***boot* How about PlayStation or Sega?**

Sweeney GT was interested in doing those, but we looked at what we could actually get onto those systems and it's like "Wow! They can make an *Unreal*-like game that fits in 3MB." Our game is 32MB. We concluded that it would be really disappointing compared to the PC version, so we didn't want to do it.

boot* Mario *64 is kicking the N64. When are you guys going to port Jazz* Jackrabbit *to the Unreal engine?

Sweeney We're looking at it. We're interested in doing that project. *Mario* is a great example of gameplay and it opened up many new possibilities, but it was also limited by having an 8MB cartridge. *Mario* just touched on the things you could do. It's about variety and having a lot of cool graphics and a lot of cool animations and...

Schmalz ...and interesting things happening all the time. You can pack so much more of that into something like the *Unreal* engine.

Sweeney A few hundred megs in *Unreal*.

***boot* Do you think the Saturn will survive?**

Sweeney They're great, viable systems. They weren't appropriate for *Unreal* because we have a game designed entirely to take advantage of what you can do on a PC with a lot of RAM and an Internet connection. So it doesn't map well at all onto any of those consoles. Nintendo 64 has enough memory and speed that it can fit, but the PlayStation and Saturn just weren't good for it. But there are a lot of great PlayStation and Saturn games. I'd say they're going to survive at least for the next few years. They'll survive to the next-generation hardware.

***boot* Are you guys developing for the Apple's Rhapsody?**

Sweeney We'll look at it when it comes out. Lion Entertainment was talking about porting *Unreal* to the Mac, but that fell into limbo when Apple ran into all its problems. If Apple emerges with a viable platform, then I'm sure that deal will be rekindled.

***boot* Is all your development done on PCs?**

Sweeney We're definitely PC people. We have three SGIs and 25 PCs.

***boot* Microsoft's PC Arcade Initiative. What do you think of that?**

Sweeney I'm not sure it's going to be a minor success or a huge success, but it's going to be there. Right now the problem with arcade machines is that each one is custom-built and unique, so they're very expensive. Most game developers just can't get into arcades. And that's where scalability really comes into play. If you had the game engine to support it, you could just run *Unreal* on it and it would look twice as cool and people would be willing to pay a quarter. Everybody is already developing for PC and it'll be a pretty easy port.

they're real-time interactive cut scenes where you walk into the room and you might see some sort of cinematic unfolding and you can either sit and watch it or you can start blasting these people and break up their little scene. We don't want to cut to a pre-rendered scene where they have to sit and wait.

***boot* What makes a good game?**

Schmalz You want the person to be engrossed and have a lot of fun.

Sweeney And leave the player in control. A lot of games are designed around cool situations rather than building cool experiences for the player... especially in a 3D action game. You want the player to be in control and leading the show.

Schmalz You don't want repetitive actions. You want players to experience new things. I stopped playing a bunch of games when I got to the point where I said "Ah, I've seen this before." It gets boring.

***boot* What game had the best graphics last year?**

Schmalz We're all spoiled by *Unreal*.

Sweeney *Hexen* had really good graphics. I've always been frustrated with those games because it seems the games with the best graphics become "click type" games and the games with the best gameplay tend to be pretty graphically sparse.

***boot* What about other first-person shooters?**

Sweeney *Quake* rocks.

***boot* What do you think of Carmack's implementation of OpenGL Quake?**

Sweeney Really cool. It opened our eyes to 3D acceleration being viable. Before that there was Rendition *Quake*, which was about 30 percent faster, but *GLQuake* really looks amazing!

Schmalz It's too bad OpenGL isn't more of a standard.

Sweeney You have much smoother graphics, but not necessarily better graphics. Everything is designed for the limitations of 8-bit software rendering. The big area of improvement in games during the next few years will be developing content that really takes advantage of the current hardware. And with *Quake*, the content's probably the best that could possibly be done for 8-bit color software rendering, but when you get into really fast high-end hardware support, you can definitely do better.

Schmalz We've been creating content for the latest technologies. A lot of the other games coming out in the next little while are bland; the content is obviously affected by the older technologies.

***boot* The developer community is pretty tight knit. Carmack has the plan files on the net. Do you guys plan to do something similar?**

Sweeney No, that's silly.

Schmalz Talking to consumers is great. We do that, but John Carmack started this little plan thing and now it's turned into everybody's own little daily journal. Carmack's original thing was to list what he plans to do each day to keep everybody up to date.

Sweeney And that was cool.

Schmalz But now, it's not what it was intended to be. It's really kind of silly. What's the point? Building your little ego, I guess.

***boot* How much do you communicate with the online community?**

Sweeney We spend a lot of time... There are already 150 web sites dedicated to *Unreal*.

Schmalz And they want information; they want to chat with us... that's cool. They love games; they want to play our games and we want to talk about it.

Sweeney I exchange about 10 e-mails a day with the really hardcore gamers interested in *Unreal*. They've given me a lot of good ideas.

***boot* Do you ever use those suggestions in the actual game?**

Sweeney Yeah, countless suggestions... We'll roll things they named right into the technology and into our ideas about levels.

The concept of night and day was suggested. So I set up a light-switchable circle according to a day or night cycle. Somebody was asking about sky. So I went through and set up 10 sky properties in *Unreal* Ed which could change sky textures. We'll have transparency, brightness, and fog, and all kinds of little things like that. For gameplay we've been loading up this big list of features that everybody wants to see in network play and once in a while some make it into the spec. One hundred minds are better than one.

***boot* What's the worst suggestion you've ever been given?**

Schmalz I ignore them.

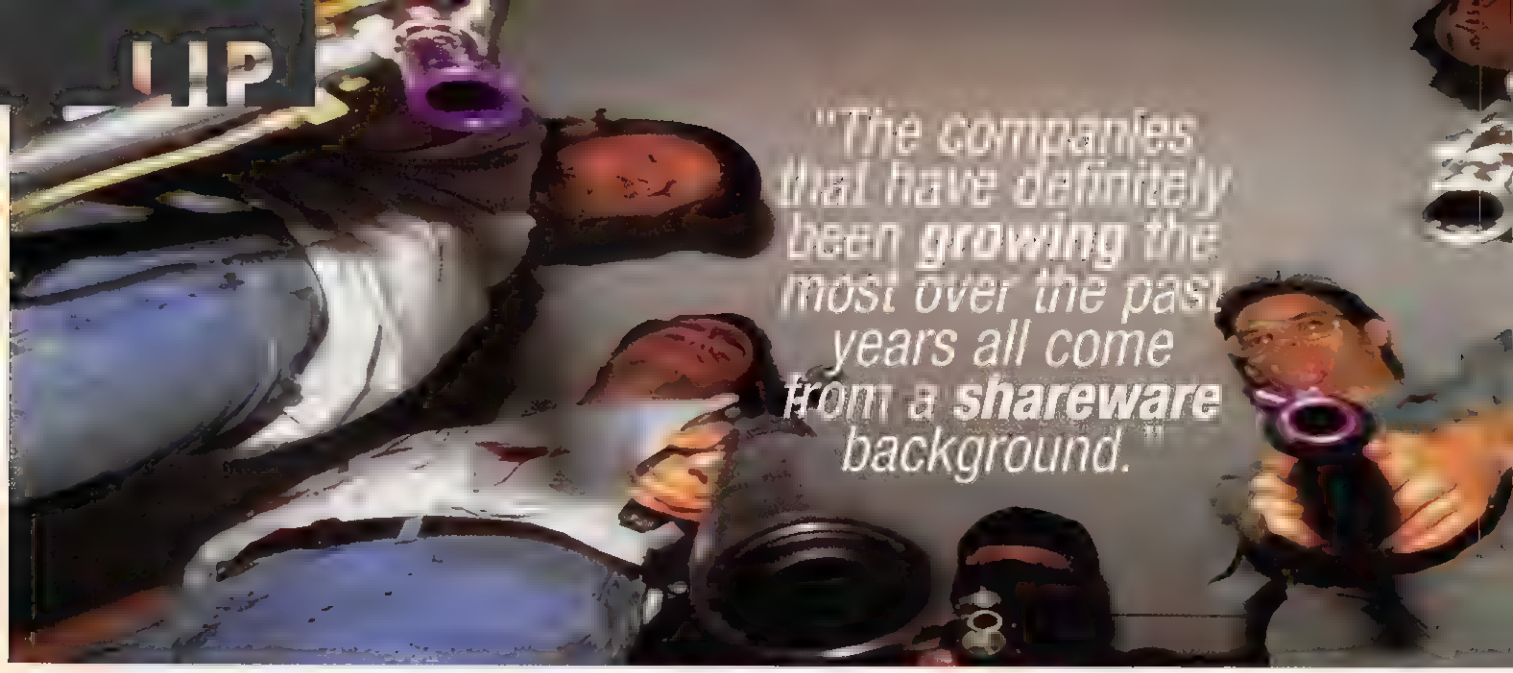
Sweeney There were some bad ones. The worst suggestions assume we're just making *Quake* and list these minor improvements, "You should make the rocket launcher shoot a little bit faster," when we don't even have a God-damn rocket launcher!"

***boot* No rocket launcher? Blasphemy! What kind of unique weapons are there in Unreal?**

Schmalz There's one weapon we call the "Stunner." It's like a charge-based thing: you press it down and it charges up and blasts the guy. The farther away, the less of a blast you'll get. You could blast them into walls, blast them off ledges. That's pretty cool.

***boot* Who's influenced you as game designers?**

Schmalz Definitely id. They've pretty much set the genre of first-person action games.



Everybody who's into this kind of game loves id's stuff. Blizzard is awesome. And in my past, I thought stuff like *Wizardry* was the greatest. The Infocom games were excellent.

Sweeney You had games such as *Zork*, where you type commands and stuff happens.

What does that have to do with a 3D game? Those games felt immersive because it's like reading a book. It's not just words—you're envisioning what's happening. To me, those games have the best graphics of any game.

***boot* What do professional level designers know that amateur level designers don't?**

Schmalz First of all, you have to be an incredibly intense game player.

Sweeney You have to be totally focused.

Schmalz You have to pretty much live games. And then have a huge passion because these things take incredible hours.

Sweeney A really good amateur level designer who spends, say, a year working on cool levels could make the transition.

Schmalz Study the masters.

***boot* And who are the "masters"?**

Schmalz Well, other than everybody on our team... of course, John Romero.

A lot of the guys on the id team are good. A lot of the guys at Hypnotic are quite good, too. Who else? The guy on IonStorm. Oh... the guys who did *Redneck Rampage* are pretty good. It's amazing, these guys who are really good, really make the difference.

***boot* So what's the dream team of game developers?**

Schmalz The *Unreal* team.

Sweeney If you got the five best level designers in the world together in a room, within 24 hours they would kill each other. So I think a dream team is any team that can work well together. We have one of those teams here. I think id had one during *Doom* and *Quake* development.

***boot* Big-name developers such as Chris Roberts or John Romero have flown the coop and split to new companies. How long before you blow outta here?**

Schmalz Well, we own our companies—I don't think we're going anywhere! [laughs]

Sweeney They got in situations where they were basically working for other people and not liking where they were forced to be.

***boot* When you guys make your first billion dollars, what car will you buy?**

Schmalz Probably a Ferrari.

Sweeney My car works just fine. I think I'd just keep getting faster and faster computers.

***boot* What kind of PC do you use at home?**

Sweeney I have a dual Pentium Pro 200, a Pentium II, and a Pentium 90. You always have to have a crappy computer to see how your game actually runs.

Schmalz I have a Pentium Pro and a Pentium 200.

***boot* What's your ultimate system?**

Sweeney I've got it!

Schmalz A Pentium 300 sounds pretty good.

Sweeney Yeah, those are good.

Schmalz With lots of RAM... 128MB of RAM, 9GB hard drive, the faster the better.

***boot* What's the most important PC technology?**

Schmalz The Pentium and 3D hardware accelerators.

Sweeney The Pentium is most important. 3D hardware will be more important in 1998, but it's not there yet. Probably only five percent of gamers have good 3D hardware. The thing that's really going to drive 3D engines is if everybody's PC is bundling good 3D hardware.

Schmalz In the past, these cards have been very close to what you can achieve in software anyway.

Sweeney Yeah, they're more like 3D decelerators. [laughs]

***boot* Such as...?**

Sweeney Just about everything that's not a 3Dfx or Rendition.

Schmalz But now... some of these cards are just amazing and there's no way you can achieve that kind of thing in software.

Sweeney But only hardcore enthusiasts are going to go out and buy an add-in. What's really going to drive 3D home is bundling the cards on computers.

***boot* S3 dominates the 3D market. What do you think of its ViRGE chipsets?**

Sweeney My software running code is 50 percent faster than their hardware. So it's not a useful technology right now for games such as *Unreal*. For some games, which aren't as taxing, it's a decent accelerator. Driving games that support the first generation of 3D hardware such as the S3 ViRGE, the ATI Rage... they do a good job there, but *Unreal* is much more demanding. And when we're rendering realistic environments with a lot of polygons and shadows and dynamic lights everywhere... that's about as taxing an application as you can have. We're finding that only the current 3Dfx hardware is able to handle it.

***boot* Intel funded development for Unreal, how did that take place?**

Schmalz We can't comment on it.

Sweeney Sure we can. It's public knowledge.

Schmalz It is?

Sweeney They helped us out early-on when they were lining up software to take advantage of MMX. They realized they needed 3D games. We've had a relationship with them for awhile and worked with them on various fun things. So we went to them with *Unreal* and they really liked it. And we worked with them; they supplied us with some really early MMX hardware, which was really great. We got *Unreal* support up and running. I think *Unreal* was the first game that was actually up and running on one of their MMX machines. They've been really cool to work with.

***boot* Do you guys have inroads to unannounced Intel technologies?**

Sweeney I don't know of any Intel technology that hasn't been announced.

***boot* So you don't know anything about MMX2?**

Sweeney Actually there is some stuff, but it's all under NDA. I think the next big thing is AGP which, will go a long way toward improving 3D accelerator performance, giving 3D cards access to all of your main memory textures. The 8MB textures and much

faster access will really be a big improvement for 3D hardware. MMX2 and all of that stuff is further off, so it's hard to predict how that's going to have an impact.

Still, it's surprising how clearly MMX has been adopted by game developers. It provides so much power, but it's hard to take advantage of it all.

***boot* Why is it hard to take advantage of MMX?**

Sweeney MMX isn't like going from a 486 to a Pentium, where you get this big improvement in processing speed. To take advantage of MMX you need to use specific instructions to design your algorithms around MMX types of data. It's a challenge.

***boot* Do you think MMX is all it's cracked up to be?**

Sweeney Yeah, it'll have a very big long-term impact on 3D and multimedia in general. We use it to get two times the speed in our sound processing and to do color lighting calculations three times faster.

In the long run, it'll be really well exploited, but it's hard to exploit now because of the lack of tools. You have to design a program from the ground up to take advantage of MMX. You really can't retrofit a product to take advantage of it.

***boot* Are there discernible differences in the performance of Unreal on non-Intel machines?**

Sweeney I've run some performance testing. *Unreal* ran fastest on a Pentium Pro 200 and second on a Pentium II 233 and third on a K6. But they're all pretty close.

Each has its quirks, but the Pentium Pro is fastest because of its Level 2 cache. The Pentium II is faster for some things, slower for others. K6 is like a Pentium II, but its floating point is about twice as slow.

Price competition is good. If K6 does anything for the industry, it will be to get the price down and keep Intel competitive.

***boot* What about M2?**

Sweeney Haven't tried it. Don't know anything about it.

***boot* Do you think it's going to have any impact?**

Sweeney Don't know.

Schmalz Are you talking about 3DO's machine? [Everybody laughs]

***boot* What about an OS/2 version of Unreal?**

Sweeney Gee, I'm sure the five OS/2 game players would appreciate it! [laughs] But seriously, no. It wouldn't be practical from a financial standpoint. It'd be a lot of work and it wouldn't have any point.

***boot* Are you saying OS/2 is pretty much dead?**

Sweeney OS/2 was "pretty much dead" a very long time ago.

***boot* IBM has stated that OS/2 is not dead.**

Sweeney A lot of big companies use it to run their servers, but that's all. Consumers do not use OS/2.

***boot* We'll be waiting for the flood of letters.**

While we're being critical, does Unreal have any obvious flaws right now?

Sweeney In software rendering there are a lot of tradeoffs between speed and visual correctness. Sometimes you see flaws in the shadows and places...

Schmalz We see them, but I don't think the average person does.

Sweeney Every 3D engine, both software and hardware, is going to have visual flaws—it's just a matter of degree. Even on 3D hardware, every engine has several prominent flaws. One is with bilinear filtering texture—you still see artifacts in a lot of games. The other thing is edge aliasing. When you see a bright edge with a flat background behind it, you see these big pixels all over the place. So until the hardware is improved by a factor of maybe 100,000, it will fall way short of what people expect from reality.

***boot* But will someone who plays Unreal say "Man, I wish they had done this"?**

Schmalz Definitely not. I think they're going to look at it and be blown away. It's a huge advance over anything out there now. The shadow errors that Tim sees, the average person is not going to see.

Sweeney Yeah, people don't see flaws until they've seen something better. Often, in the game industry, a new technology comes out and it blows people away and they think it's perfect. You know, like the *Doom* technology—you look at that and think, "That's perfect 3D and it's not going to get any better than this"—until *Quake* comes out and then you think, "Wow, this is perfect. It's not going to get any better." And then *Unreal* comes along. And now if you look back at *Doom* or *Quake* you say "Wow, that was really limited. There are no shadows and there's no X, Y, and Z," but people tend not to notice that at the time.

boot* Unreal *2. Is it already started?

Sweeney Just vague accumulated cool ideas.

***boot* So what cool ideas have been bumped to Unreal 2?**

Sweeney Skeletal animation. You'd have creatures completely responding to physics and creatures punching each other. You could have great hand-to-hand combat with collision, in terms of people's arms hitting other people's arms and faces. Right now collision is primitive, it's not that cool. Guys are either touching or not and you don't have any idea of where.

Schmalz Very accurate collisions. These are things developers have been thinking about for years. We're just getting to the point where we can achieve that.

Sweeney As hardware gets faster, a lot of other rendering techniques are suddenly possible because you have more horsepower. And when you can assume that the average consumer has a Pentium II and a next-gen 3D card, you can do really amazing stuff—fractal surfaces, bump-mapping, and all kinds of real-time effects, which require a ton of CPU power. We'll be incorporating a lot of those things into the *Unreal* technology.

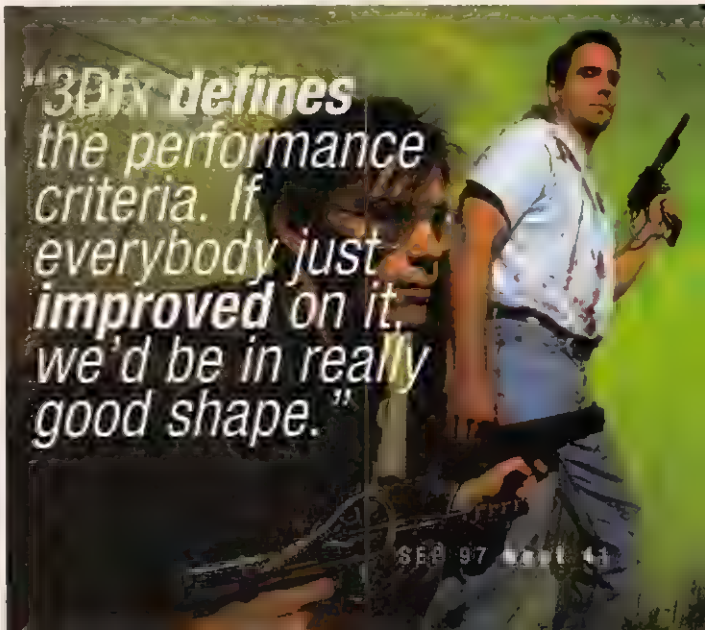
***boot* What kind of games lie beyond first-person shooters?**

Schmalz It's just a matter of coming up with the right game. *Tomb Raider* did a fairly good job of doing third-person perspective.

Sweeney You'll see real-time strategy games going 3D. There are already some prominent ones in the works that will be big. You'll always see these two factions of games: one where you're controlling one guy experiencing the environment; the other where you're commanding some army... a large-scale game where you control a lot of resources.

Schmalz If you have a third-person perspective game and you're controlling one individual, you don't have as much control and you can't aim your gun as well.

Sweeney Yeah, we had third-person in *Unreal* for a while. In fact, they're still in for testing, but it didn't work for this game. That's great for a puzzle-oriented game such as *Tomb Raider*, but you have these problems with aiming. In third person you're watching somebody else do something... and that's not natural. The controls will never be as intuitive in the third person as in the first person because you always have this problem of wanting to see the player from interesting angles, not just straight from behind. How are the controllers supposed to respond when you're looking at the player from the side view and he's looking forward, and you press "forward"? Do you want him to go left or right or forward or center? It will always be a problem. I don't think that will ever be solved. It will just be improved on. In contrast, first-person control is intuitive and clean.



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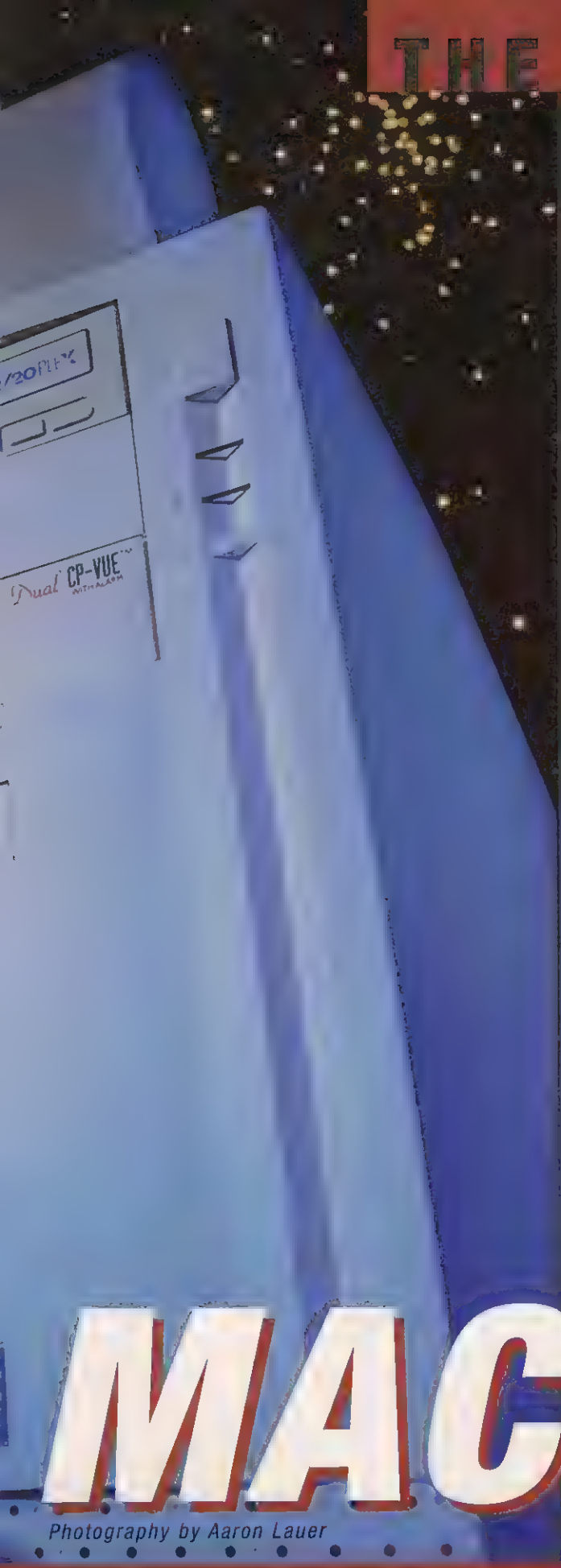

MACHINE

*We **hand-built** the world's **best** personal computer and, with this guide, **you can too**!*

*At its core, the boot mission is deceptively simple: We want **Pure PC Power**. We want PCs stuffed with primo components. PCs tweaked for ultimate performance. PCs that have acheived their full potential. Yes, we're driven by an unflagging pursuit for PC perfection. That's why we take $5,000 every year and employ every resource at our disposal to construct the Dream Machine, a no-excuses juggernaut that shatters the benchmark scores of every system we've ever reviewed.*

The quest for Dream Machine 97 began with heated debates among the bootEditors. Should the system be a mix of every Kick-Ass product we've ever reviewed, or a demonstration of elegant component integration? Should it be the ultimate gaming machine, or a workstation-class NT box? What about the video and 3D cards? Was SoundBlaster compatibility important anymore? What statement would each component convey to you, the bootReader, the most discriminating computer enthuslast alive?

The arguments were loud and lengthy. We spent many a lunch at Soo Fong's debating parts and strategies. As our vision grew, we suddenly "needed" $6,000, $7,000, $8,000—but we limited ourselves to $5,000 out of respect for your bank account. The Dream Machine is a computer you can actually build yourself. And since it's stuffed with only the best components, you won't have to worry about upgrade costs until at least, well, next year.

We're damn proud of this monster, and you'll be too if you're the lucky stiff who wins it.

*On the next eight pages, we blueprint the Dream Machine piece-by-piece. Check out the staggering bootMarks it posted, then send an e-mail to: **dreammachine@bootnet.com** and tell us about your component choices... That is, once you stop shaking your head in sheer awe.*

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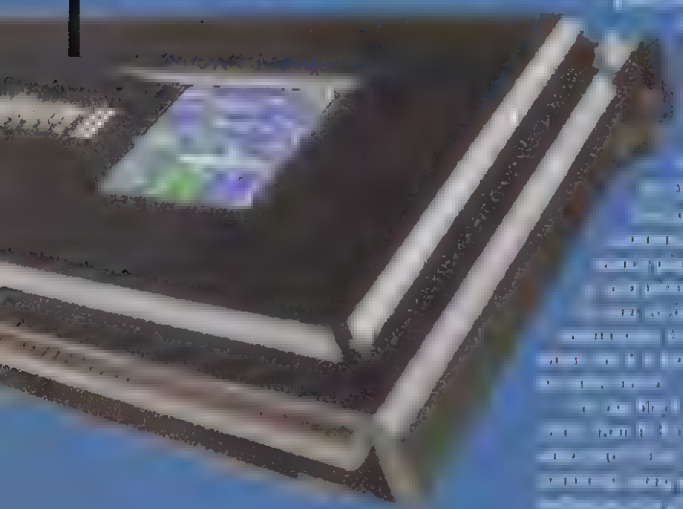
Photography by Aaron Lauer

PROCESSOR: Intel's 300MHz Pentium II



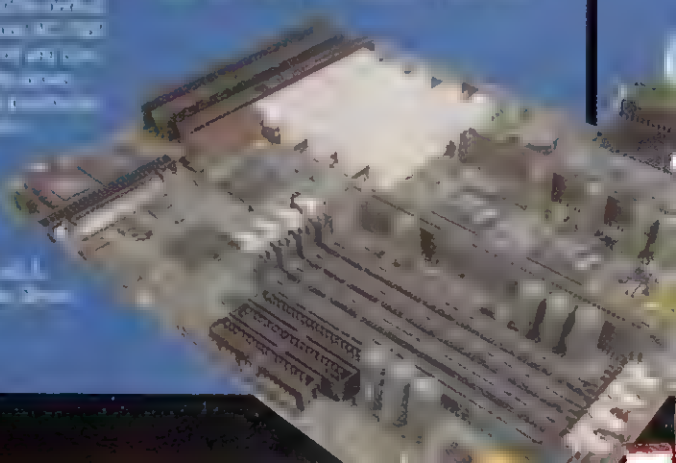
Price:
Alternatives:

MOTHERBOARD: A.I.R. P6-KD

Price:
Alternatives:

CHILLING OUT

Pentium II's run damn hot when overclocked. They're spec'd to 150 F, and you'd be surprised by how fast a higher clock speed will take you to that temperature. Intel recommends two types of cooling systems for P-IIs: passive heat sinks that pull away heat from the CPU, and active processors, such as fans and peltier coolers, that dissipate heat. We tried to locate a peltier cooler that fit an SEC, but none are available yet, so we went with a **Quad-G fan-mounted heat sink** ($40) that combines both passive and active cooling processes. To track the cooling, we installed **Quad-G's Dual CP-Vue** ($40), which is a combination of a digital thermometer that monitors the temperature inside your case, and an LCD that attaches to the front of your computer, and displays the numbers. When running the bootMarks, the system never made it above 100 degrees. Yes!



3D CARD: Diamond Monster 3D

The 3D card debate lasted about three seconds. If you measure a 3D chipset's success by the wealth of its eye-popping native titles, then the 3Dfx Voodoo has gone triple platinum. The Voodoo is where programmers go to show off. It is the standard by which 3D games acceleration is measured.

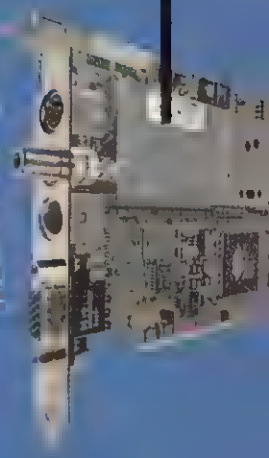
The Voodoo achieves its incomparable texture-mapping speed through parallel processing. 3Dfx has leveraged two separate memory systems to work this magic: One talks to 2MB of frame buffer, while the other simultaneously sucks textures out of 2MB of dedicated texture memory. The end result is arcade-caliber visual quality and frame rates.

We chose the **Diamond Monster 3D** over other Voodoo-based boards because it comes with better drivers, and a bigger bundle. Diamond has proven it will push drivers as far as they can go, and when the price of the Monster 3D fell within the range of other Voodoo-based cards, we had a lock. With so much developer support, you can be certain you won't be disappointed with this card for a long time to come.

Price: **$159**

Alternatives: 3Dfx Voodoo cards are 3D-only accelerators that override your primary display adapter when 3D is called for. The downside of this all-or-nothing approach is that the Voodoo chipset can only work full-screen; it provides no speed boost to 3D in a window (such as VRML). Another 3Dfx chipset, the Voodoo Rush, gets around this by allowing its 3D side to share a frame buffer with a closely paired 2D chip on the same board. Unfortunately, the 2D chips that work with the Voodoo Rush have their own set of drawbacks. This knocked the Rush out of contention (though it would have been nice to preserve a PCI slot). The only other dedicated 3D accelerator in contention was the **VideoLogic Apocalypse 3Dx** driven by the PowerVR PCX2 chipset. This card sports some amazing native content, but its general developer support is lacking. In the 3Dx's favor, however, is the ability to write over the PCI bus into our 2D video card's frame buffer, allowing its 3D to be pumped onto a TV. You can't do that with a Voodoo.

VIDEO: ATI All-In-Wonder



The 4MB **All-in-Wonder** is an elegant combination of 3D accelerator, TV tuner, and video capture card—all mixed together with a good dose of style. Sure, the Rage II+ chip powering the All-in-Wonder doesn't deliver eye-popping 3D horsepower (which is why we went with a separate 3Dfx card), nor does it offer the fastest 2D. But it's fast enough, supports high resolutions, and has polished, full-featured drivers. Its scaled video quality is the best in the world. The All-in-Wonder may not win every event, but nothing can touch it in the Decathlon.

Thanks to the All-in-Wonder's impactTV chip, it can output to your TV any screen resolution up through 800x600. In doing so, it preserves image quality and sharpness despite the low-res nature of NTSC. It even outputs the funky resolutions defined by DirectX, such as 512x384 or 320x400. The ultimate PC is suddenly the ultimate TV gaming console.

The All-in-Wonder also excels at high-resolution desktop work. It runs true color at 1280x1024 and high color at 1600x1200, and still delivers good 2D speed and full screen video playback. The TV tuner is the final icing on the cake. In addition to allowing you to channel surf while you net surf, the software will automatically make transcripts of TV shows from closed-captioning information. Or you can just use the video-capture features to save your favorite *King of the Hill* clips to the hard disk.

Price: **$239**

Alternatives: At press time, many boss new graphics technologies were on the horizon. The Nvidia Riva 128 chip to be found in the **STB Velocity 128/3D** is looking particularly hot. Not to be outdone, **ATI's Xpert@Play**, driven by the 3D Rage Pro chip, is due out soon, surely to be followed by an **All-in-Wonder Pro**. Also look for boards powered by the new **Rendition V2200**.

SOUND CARD: Diamond Monster Sound

It's inevitable: Your sound card will eventually leave the ISA bus for a much happier home on the PCI bus. The PCI bus can handle several simultaneous audio streams, as well as 3D filtering and mixing onboard. With ISA sound cards, all of this activity has to done by the CPU. Additionally, when an ISA bus performs audio DMA transactions, the CPU waits until the transaction is complete. The PCI bus, however, is smart enough to spare the CPU its silly little DMA transactions.

This said, the **Monster Sound** is the best PCI sound card we've heard. It handles 24 independent audio streams containing 16-bit digital audio, and up to 32 voices of wavetable audio. It's also equipped with two independent stereo outputs, so you can hook up four different speakers for killer DirectX surround sound effects.

The Monster Sound is a next-gen sound solution so old-school gamers might suffer. There's an emulator for games that require a protected DOS mode, but it takes up two additional IRQ's on top of the one already required by the card. For absolute compatibility, the Monster Sound can work alongside a SoundBlaster card, piping audio signals in a scheme similar to the way a 3Dfx works. Finally, the Monster's 2MB wavetable audio daughtercard falls into the "adequate" category. Luckily, the card is WaveBlaster compatible, so MIDI audiophiles can easily upgrade to a better wavetable card, such as the Yamaha DB50XG or the Roland SCD-15 Sound Canvas.

Price: **$191**

Alternatives: We wanted to avoid putting any ISA cards into the Dream Machine in order to decrease wait states on the PCI bus, and make the entire system perform faster (see "Optimizing for Performance"). If you don't mind ISA cards, we highly recommend the **Turtle Beach Pinnacle**, especially if you're the next Thomas Dolby. It offers the cleanest audio signals around for professional sound mixing.

Dream Machine 97

It came, we saw, it conquered

Dream Machine 97 is pure, unadulterated PC glory—a benchmark-setting powerhouse hand-assembled by the bootBoys, and optimized for your computing pleasure.

The machine's mid-sized ATX tower case is designed for ultimate accessibility with a sheet-metal motherboard bracket that slides from the rear. Inside lurks the fastest Intel-based processor ever—the 300MHz Pentium II—nestled into Advanced Integration Research's P6 KPI dual Pentium II ATX motherboard. The board is armed with Intel's 440FX PCIset, 64MB of memory, and just about every I/O orifice under the sun. An integrated Adaptec AIC7880 PCI-to-Ultra Wide SCSI Controller sits pretty next to the EIDE and floppy header connectors. NT buffs will dig the second Slot 1 for multi-processor madness. While the board's PCISet supports up to 1GB of RAM, the four 168-pin DIMM slots will get you to only 512MB, one 128MB buffered DIMM at a time.

Four bus-mastered PCI slots, two ISA slots, and a single shared PCI/ISA slot assume expansion duties. Out of all these options, the slow-ass ISA bus has been abandoned entirely. The Dream Machine's video subsystem consists of a double Kick-Ass combo: ATI's 3D Rage II+-powered All-In-Wonder and Diamond's 3Dfx-powered Monster 3D. What more can you ask for? Killer Windows 2D? Got it. TV-out and -in? Yes. The best MPEG/Win95 FMV playback quality in the world? Uh huh. Step into the world of bilinear-filtered 3D acceleration, and you'll feel the power of awe-inspiring Voodoo graphics. For a complete sound solution, the machine cranks Diamond's Monster Sound with a 2MB wavetable upgrade. It supports DirectSound, DirectSound 3D, GMIDI, and Sound Blaster compatibility—all via the souped-up PCI bus.

For storage, the machine is all SCSI. Plextor's 12/20PleX CD-ROM drive is one of the few drives that pushes data at a consistently high transfer rate. It's also ready to read CD-RW disks. For mass storage duties, Micropolis' 4.3GB Stinger SCSI hard drive fills the bill, while Iomega's SCSI Zip drive tides you over until DVD-RAM hits. Two 5.25-inch drive bays are ready for expansion needs.

Other goodies include Logitech's ergonomic four-button mouse, Thrustmaster's Millenium 3D joystick, U.S. Robotics' X2 Sportster modem, and Altec Lansing's ACS48 PowerCubes Plus speaker system. Not a compromise in the bunch—and the 19-inch Optiquest display is simply the best value in monitors around.

Performance-wise, Dream Machine 97 is just plain scary, destroying almost every benchmark we have. In the bootMark, the computer posts an incredible 145 (compare that to the 50s and 60s posted by most MMX P200s). The MDK PerfTest flies into the 145 range, making this machine da DirectX bomb. SysMark32 scores are dreamy—how fast do you need to scroll that Excel spreadsheet anyway?—and hard drive performance is solid. CD-ROM speed is the best we've seen so far, and with the help of FastVid, *Quake* posted equally impressive scores. The Dream Machine can work as well as play, so compile away and number-crunch 'til the cows come home.

It doesn't get any better than this.

Building a machine with powerful components doesn't guarantee powerful performance. BIOS settings and OS device drivers ultimately make the difference. Here are some of the things we did to tune the Dream Machine into an over-achieving monster.

We abandoned the ISA bus. PCI, the current de facto 32-bit bus, offers a peak throughput spec'd to reach 264Mb/s. ISA is a 16-bit bus that tops out at around 8Mb/s. Because the PCI bus runs faster than the ISA bus, it must be slowed during interactions. To compensate, the PCI architecture distances its relation to the ISA bus in two ways: Passive Release allows the PCI bus to continue working while receiving data from ISA devices, and Delayed Transaction lets PCI bus masters continue to work by delaying transmissions to ISA cards.

boot *editors at play.*

ISA is an old, decrepit bus whose day has passed. It only persists because of legacy peripherals such as sound, SCSI and modem cards. The Dream Machine uses a PCI sound card, built-in SCSI on the motherboard, and an external modem—no ISA cards anywhere. We did this so we could tweak the communication speed between the two buses and the CPU. The BIOS setting that controls this timing is the PCI Latency Timer, which is measured by the number of PCI Clocks. Values range from 0 to 255, with lower values lowering bandwidth and data throughput while offering better response times to the bus by system devices. It is usually safer to keep this number low (usually around 32) for ISA cards. We increased the number to 128. This, and the absence of ISA cards, helped us pull an extra 10% to 15% performance boost out of the system.

Software Editor Sean Downey plays peekaboo with the PCI bus.

We also optimized the Dream Machine with a shareware application called FastVid (version 1.03). FastVid is used for Pentium Pro and Pentium II motherboards based on the 82450 and 82440 chipsets. It improves graphic performance in DOS and Win95 by enabling cache posting cache writes for the PCI bus. It also enables banked VGA write combining, which allows separate writes to the VGA mechanism to be combined into a cacheline that can be bursted out to video memory via the PCI bus. FastVid enables SVGA linear frame buffer write combining to make access to video memory simpler and faster. Ultimately, FastVid increases throughput to video RAM to 88Mb/s, and PCI throughput to 18Mb/s.

SHOPPING LIST

Intel Pentium II 300MHz www.mtrends.com, 888.868.7368	$851
AIR P6-KDI Dual Pentium II motherboard www.airwebs.com, 408.428.0800	$550
64MB buffered ECC EDO DIMM www.cybertechmall.com/kpo/index.html, 800.888.3[illegible]	$361
Diamond Monster 3D www.diamondmm.com, 800.468.5846	$159
Diamond Monster Sound 3D www.diamondmm.com, 800.468.5846	$191
ATI All-in-Wonder www.atitech.com, 905.882.260	$239
Altec Lansing ACS48 PowerCube PM www.altecmm.com, 800.648.6663	$148
Internal Iomega Zip Drive www.iomega.com, 800.697.8833	$135
Plextor 12/20PleX CD-ROM Drive www.plextor.com, 800.886.3757	$248
Logitech 4-Button mouse www.logitech.com, 800.231.7717	$49
US Robotics Sportster 56K Fax Modem www.usr.com, 800.342.5877	$190
Cherry Electronics G83-6300 Keyboard www.cherrycorp.com, 847.662.9200	$40
OptiQuest V95 19" Monitor www.viewsonic.com, 800.888.8583	$950
Micropolis Stinger 4.3GB UW Hard Drive www.micropolis.com, 800.395.3748	$395
IW-A500 ATX Medium Tower case w/ 300W Power Supply www.compudex.com, 619.467.9305	$110
Thrustmaster Millenium 3D www.thrustmaster.com, 503.615.3200	$70
Samsung Floppy Drive www.samsung.com, 888.[illegible]	$25
Cooling Fan www.cpvue.com, 800-888-4437	$40
CP-VUE Early Warning System www.cpvue.com, 800-888-4437	$40
Windows 95 OSR2 www.microsoft.com, 800.426.9400	$90
TOTAL	**$4,944**

WHAT!?!

Don't have $5,000 to build **your own** Dream Machine?

Just enter *boot's* Dream Machine contest and

WIN

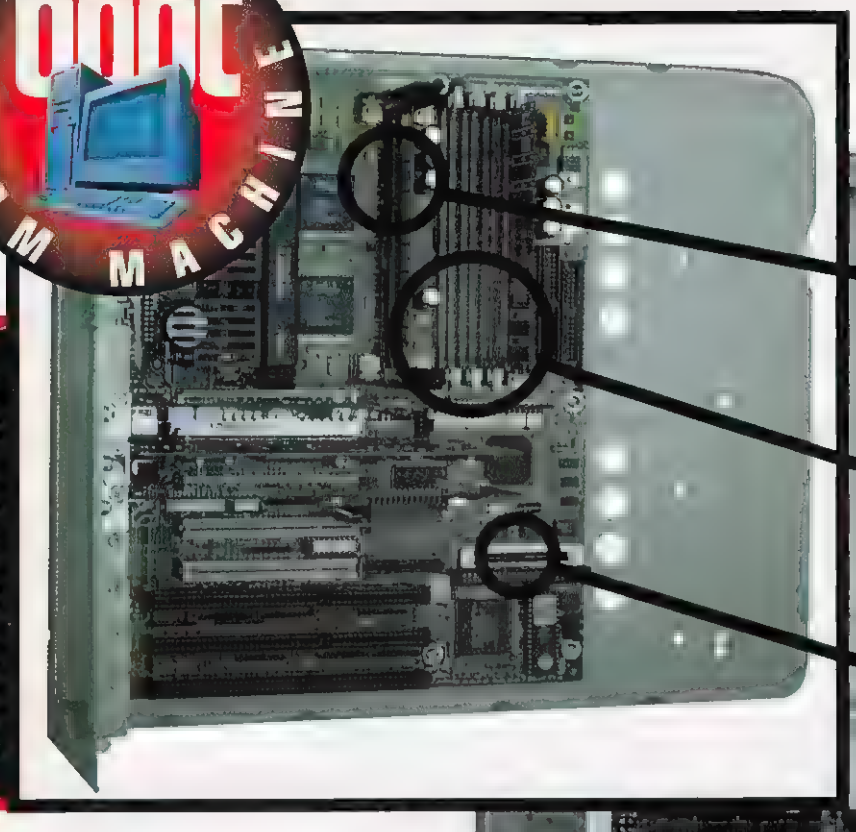
the ultimate PC, as hand-built by *boot's* editors

To enter, simply go to the hidden section of the *bootDisc* shown above and click on the button to go to a secret page on the *bootNet* website where entries can be filed online.

see page 12 for more details

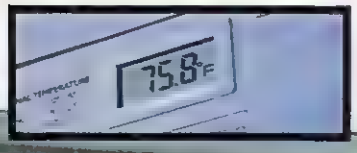
1997 boot DREAM MACHINE

pull out motherboard



FEEL THE HEAT

The Dual CP-Vue on the Dream Machine's fro panel displays the temperature inside the ca and sets off an alarm when the CPU gets too for safe operation.



DOUBLE DIP, LET YOUR PROCESSORS RIP

I CAN'T BELIEVE IT'S NOT BUFFERED!

WHEN IDE ISN'T ENOUGH

THE DYNAMIC VIDEO DUO

Combine ATI's awesome 2D, TV, and video performance with 3Dfx's hallmark 3D graphics, and you have all the video power you need... this year.

under the hood

THE BRAINS	
CPU	Intel Pentium II 300Mhz
L2 Cache	512K pipeline burst internal
RAM	64MB buffered ECC EDO DIMM
Motherboard	A.I.R. P6 KPI dual Pentium II ATX
THE BRAWN	
Video Card	ATI All-in-Wonder(3D Rage II+) w/4MB, Diamond Monster 3D (3Dfx Voodoo) w/4MB
Hard Drive	Micropolis Stinger 4743WS 4.3GB SCSI
CD-ROM	Plextor 12/20PleX SCSI
Expansion Bus	4 PCI, 2 ISA, 1 shared PCI/ISA
Fax/Modem	US Robotics Sportster 56K x2 external
I/O Ports	Two serial, one parallel, two USB
THE BEAUTY	
Display	ViewSonic Optiquest V95 19"
Sound	Diamond Monster Sound 3D PCI sound card w/2MB
Speakers	Altec Lansing ACS48 PowerCube Plus
Others	Logitech 4-button mouse, CP-Vue LCD temperature

EXPANSION MAP

PCI	ATI All-in-Wonder
PCI	Diamond Monster
PCI	Diamond Monster Sound
PCI	Free/Shared
PCI	Free
ISA	Free/Shared

THE BUNDLE* Windows 95 OSR2 | Device drivers for cards | SimCopter | Outlaws | Tigershark | Worldview | Descent II Destination Quartzon | EF2000 | Whiplash | VR Soccer | MechWarrior II | Hyperblade | Scorched Planet by Criterion Studios LTD (trial) | Tomb Raider (trial) | Hellbender (trial) | Monster Truck Madness (trial) | Decathlon (bonus version) | Captain Quazar (bonus version) | You Don't Know Jack (bonus version) | Diablo (bonus version) | The Neverhood (bonus version) | Road Rash (bonus version) | Fire Fight (bonus version) | (Hold on to Your) Nuts! (bonus version) | Drowned God (bonus version) | Ravage D C X. (bonus version) | Flight Unlimited (bonus version) | War Wind (bonus version) | Free Enterprize (bonus version) | Death Dome (bonus version) | Director 4 0 | PhotoSuite | MechWarrior 2

*Games come bundled with Monster 3D, Monster Sound and All-in-Wonder

boot	down
:47	:2.72

NOTHIN' BUT A PCI THANG

By using the PCI bus rather than any resource-hoggin ISA device, we've increased system performance by 10 to 15 percent—and we're meeting PC'98 specs as well.

WAITING FOR SONIC IMMERSION

Once games take advantage of DirectSound, people can kiss Sound Blaster compatibility goodbye. I wanna kick in the rear speakers serious immersion techniques, Altec's ACS45 speakers.

SIGNED, SEALED AND DELIVERED

We're so proud of the Dream Machine, we autographed it underneath the motherboard—and some of the signatures are even legible! The lucky winner of this PC is going to have a lot of fun forging our names on bad checks.

SLIP SLIDING AWAY

DARTH VADER WOULD BE PROUD

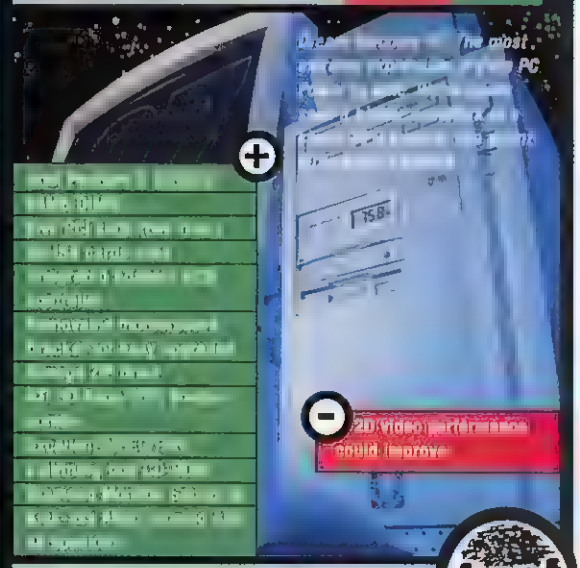
Nothing can compare to the awesome might of the fully armed and operational Dream Machine

boot

Dream Machine

real-world benchmarking

CPU/MOTHERBOARD *bootMark*	145	
WIN95 APPS *SYSmark32*	225	
DIRECT 3D	composite 833	
HARD DRIVE *Adaptec ThreadMark v1.0*	MB/sec 3.44	
CD-ROM *CD Tach/Pro v1.65*	K/sec 2665	+
WIN95 VIDEO *VidTach v1.52*	% played 48.8	
DOS GAMING *Quake v1.06*	fps 22.4	+
DIRECTX GAMING *MDK PerfTest v1.4*	137	+
MMX PROCESSING *DeBabelizer Pro*	secs 202	+
CPU/DISK *Microsoft Visual C++ compile*	secs 117	



Price $4,944
Company boot
Phone 415.468.4684
URL www.bootnet.com

boot verdict 10

* Dream Machine 97 includes a 300MHz P-II but none were available at press time so for benchmarking purposes we installed a 266MHz processor, and overclocked it to 300MHz. We're confident a 266MHz P-II overclocked to 300MHz performs the same as a true 300MHz part. The Dream Machine's 300MHz P-II will have arrived at boot by the time you read this, so check www.bootnet.com for a report on benchmarking discrepancies (if any) and what happens when you overclock a P-II 300MHz to 333MHz.

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

SPEAKERS: Altec Lansing ACS48

When you hear the **ACS48**'s mix of tight, confident lows, rich middles, and clean highs, you'll give it up for this elegantly matched satellite system. Whether you're a die-hard *Quake* clanner who requires the deepest-sounding rocket blasts, or a demanding John Coltrane fan who needs the truest sonic clarity, these speakers provide the satisfaction of systems that cost twice as

reproduction—a 6-inch woofer can only go so far.

Price: **$149**

Alternatives:

REMOVEABLE STORAGE: Iomega Zip Drive

you can be sure that if you step out the door with a Zip disk in hand, you'll be able read it when you get where you're going. The **Zip drive** is the fastest removable storage option. Its 100MB capacity the largest. But the Zip is extremely reliable, and by far the most popular solution in its category.

Price: **$135**

Alternatives:

Speed than ubiquity, check out either Iomega's **Jaz** or SyQuest's **SyJet**. And if you need to write your data, and then read it on *any* PC, you'll want a hearty CD-R drive such as the Kick-Ass Yamaha **CDR400**, or Yamaha's new CD-RW drive.

CD-ROM DRIVE: Plextor 12/20PleX

When Plextor conservatively guarantees between 12x and 20x performance out of its new CD-ROM drive, it's just being humble. *The drive is fast; there is none better.* Since it's a CAV drive (like most of its high-speed competitors), it rotates discs at a constant speed. Because CAV drives aren't required to change motor speed as often between random seeks, they have better random access performance than CLV drives. The constant speed is easier on the motor, but it translates into different

The **12/20PleX** is a multiread drive, which means that it has an optical

information on disc format, file type, tracks, and sessions.

ROM drives.

Price: **$248**

Alternatives:

with movie playback than DVD-ROM drives.

MOUSE: Logitech 4-Button Mouse

mouse is so smooth and responsive. Even in graphics-intensive games like

menus, and skirt around your desktop.

Price: **$49**

Alternatives: We also considered **Logitech's Cordless**

problems. While an untethered mouse is nice, we were less

slightly lopsided sliced egg.

MODEM: US Robotics Sportster X2

the best lines usually give you throughput speeds in the high 40s). X2 currently enjoys better ISP support than

Yep, USR's X2 was a no-brainer. ***Price:*** **$190**

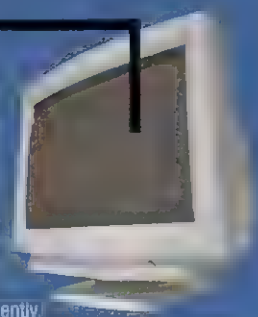
Alternative:

KEYBOARD: Cherry Electronics G83-6300

We don't give a rat's ass about pretty "ergonomic" keyboards. All we need are 104 keys, and a spill-resistant surface. The blue-collar **G83-6300** is perfect for people who want to parlay their money into PC power, not medical fauls.

Price: $40
Alternatives: The **Sejin FreeBoard Beamer** is our favorite wireless keyboard. It might be "fancy," but it's still fun to frag from the comfort of the sofa.

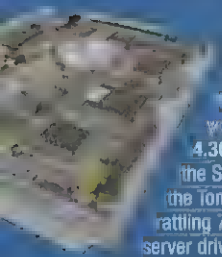
MONITOR: OptiQuest V95 19-inch



The **Optiquest V95** is an amazing screen machine. It has the footprint and price of a 17-inch monitor, yet delivers a whopping 19 inches of screen space, and has features and video quality to rival pro models. And it can sync to amazingly high resolutions, such as 1600x1200 at 76Hz, and 1280x1024 at 88Hz. Wow. When we saw this price, we high-tailed it out of 17-inch territory. For the full scoop on this beautiful desk-topper, see the review on page 100.

Price: $995
Alternatives: For quality and value, no other monitors can compare to the V95. Your only alternative is to spend some big bucks on a full 21 inches, or save a few hundred by going for a cheaper 17-inch. Just remember that the monitor is the last place you should skimp when building your own Dream machine. You can upgrade your CPU and RAM fairly frequently, but you'll likely be staring at the same monitor for years to come.

HARD DRIVE: Micropolis Stinger 4.3 GB



Micropolis brings the awe-inspiring throughput of Ultra Wide SCSI to your front door with the new **Stinger 4.3GB** hard drive. Priced under $400, the Stinger uses the same firmware as the Tomahawk, but instead of the platter-rattling 7200 rpm speeds of the high-end server drive, the Stinger spins up to 5,400 rpm. The 512K cache and 10.5ms seek time combine to keep the data you need right at your drive's fingertips. We pulled sustained throughputs from this drive that are comparable to some 7,200 rpm Ultra DMA drives. SCSI hard drives consume less CPU resources than IDE drives, thanks to their bus-mastering host adapters, and perform better on simultaneous tasks. The Stinger proves to be no exception with a CPU utilization mark of 18 percent.

Price: $395
Alternatives: If you're looking for the ultimate hard drive experience, check out the **Seagate Cheetah**. Sporting 10,033 rpm spindle speeds, and a 7.5ms seek time, it's the fastest drive currently available. The 4.55GB version will set you back $1,344.

Sadly, we couldn't afford it.

CASE: CompuDEX ATX Medium Tower

We searched for a case that wasn't too large or too expensive. The **CompuDEX ATX Tower** is a little wider than your average case, with space to house three 5.25 bays, and four 3.5 drive bays. It's constructed out of 1.0mm sheet metal, and features a screwless front panel. The thing that really sold us was the quick-and-easy motherboard access offered by the slide-in rear drawer module.

Price: $110
Alternatives: If you're looking for the ultimate in cases, use that **old refrigerator** stored in your garage. You can't get better CPU-cooling circulation, and it's got plenty of room for expansion. Hey, we use one at *boot*.

CONTROLLER: Thrustmaster Millenium 3D

[illegible] buttons, a single-stage trigger, a throttle, and one four-way hat switch. Along with left-and-right roll-and-twist motions across all three axes, the Millenium replaces traditional joystick up-and-down action with a sliding back-and-forth motion.

Price: $70
Alternatives: For fighting games and sports sims, you'll want the **Gravis GamePad Pro**. It features 10 buttons, and a terrific programming interface. For first-person shooters, we recommend the category-creating **SpaceOrb 360**, which allows for seemingly impossible moves.

FLOPPY DRIVE: Samsung Floppy Drive

What can you say about a floppy drive? You find the cheapest, install it, and it works as well as every other floppy drive you've ever used since 1986.

Price: $22
Alternatives: We briefly considered going with an **a:Drive** for both SuperDisk (LS-120) and traditional [illegible] writes. It was to have been our removable storage solution. We eventually decided to err on the side of compatibility: Zip is the popular standard for removable storage, so this is the technology we landed on.

DREAM MACHINE 98

Technical Editor Chris Dunphy Predicts the Future of PC Power

In 1998 we'll witness the extinction of 2D- and 3D-only acceleration chips. It just doesn't make sense to have multiple graphics chips in a system; there's too much redundancy. 3D-only accelerators may remain important in the upgrade or premium system market, but by the time we're building Dream Machine 98, they'll be on their way out. Dream Machine 98 will certainly be speaking to its 2D/3D card over a 2X AGP interface. At first, AGP will make little difference, but once games are written to take advantage of the 30 megs of textures or more that AGP allows, we should see some magic.

DVD-ROM will have all but replaced CD-ROM this time next year, though most content will still be on CD, not DVD, for quite a while. DVD-RAM will make a gradual appearance, slowly replacing the likes of Zip and Jaz drives. And while it may not happen in 1998, Dream Machines in the future will have a DVD-RAM drive that replaces the CD, DVD, floppy, tape backup, and Zip. Who can argue with 2.4GB per side of rewriteable, inexpensive storage?

CRTs will continue their slow drop in price, and 19-inch screens will become more popular. Thanks to the upcoming multiple-monitor support in Memphis and NT 5.0, Dream Machine 1998 will probably have an inexpensive secondary screen attached.

SDRAM with a 100MHz bus speed will be the memory of choice. Cranking up memory speed will provoke a more dramatic speed boost than cranking up CPU speed. By the end of 1998, we may even be seeing the first few Rambus-based computers, with memory speeds faster yet. As memory continues to get cheaper, 64MB of RAM will be common, while 128MB or more won't be rare.

Deschutes, next up in the Pentium II line, has a good chance of powering Dream Machine 98. When paired with the 440BX chipset, Deschutes will at last support a 100MHz memory bus, and will be cranking internally at well over 300MHz. If prices continue to fall, we may be able to cram two CPUs in the box, leading to multi-processor nirvana.

Next year's OS will almost certainly be Windows NT 5.0. Featuring integrated DirectX 5.0, support for 3D hardware accelerators, recognition of plug-and-play hardware, and a nifty new object oriented file system, NT 5.0 will at last remove any advantages that Windows 95 provides. USB will be connecting speakers, joysticks, modems, scanners, and cameras to Dream Machine 98, while the old-style joystick, parallel, and serial ports will be on their way out.

Media On GAME EXTREME

MGPX166 Featuring:

- Intel 166MHz Pentium® Processor with MMX™ Technology
- Intel TC430 HX Motherboard with 512K cache
- 16 MB EDO RAM with System
- 2.1 GB EIDE Hard Drive/1.44 MB Floppy Drive
- S3 ViRGE with 4MB EDO RAM
- Yamaha Sound System
- 12X CDROM
- 104 Win95 Keyboard & Mouse
- Mini-ATX CASE with 235 Watt Power Supply
- Microsoft Windows 95 /McAfee VS Scan
- Monitor Sold Separately

MGPX166 $985

MGPX200 Featuring:

- Intel 200MHz Pentium® Processor with MMX™ Technology
- Intel TC430 HX Motherboard with 512K cache
- 32 MB EDO RAM with System
- 2.5 GB EIDE Hard Drive/1.44 Floppy Drive
- S3 ViRGE 3D with 4MB EDO RAM
- Yamaha Sound System (OPL3 Driver)
- 16X CDROM
- Mini-ATX CASE with 235 Watt Power Supply
- PS/2 Keyboard & Mouse
- Microsoft Windows 95
- Media On Special GAME PAK
- Monitor sold separately

MGPX200 $1,299

MMX™ intel inside pentium®II

Note: Intel Inside and Pentium are registered trademarks and MMX is a trademark of Intel Corporation. All other names are properties of their respective corporations. Price and specifications are subject to change without notice. Not responsible for typographic errors.

Media On GRAPHIC EXTREME

MEPX200 Featuring:

- Intel 200MHz Pentium® Processor with MMX™ Technology
- Intel TC430HX Motherboard with 512K Pipeline Burst Cache
- 32MB EDO RAM/1.44MB Floppy Drive
- 4.5 G Ultra Wide SCSI HD with UW SCSI Controller
- MATROX 3D with 4MB SGRAM
- Yamaha Sound System
- 16X SCSI CDROM
- PS/2 keyboard & Mouse
- Windows 95/McAfee VS Scan
- Monitor Sold Separately

MEPX200 $2,155

Expert II Featuring:

- Intel 233MHz Pentium® II Processor with MMX™ Technology
- 32MB EDO RAM/1.44MB Floppy Drive
- 4.5 G Ultra Wide SCSI HD with UW SCSI Controller
- PS/2 keyboard & Mouse
- Yamaha Sound System
- 16X SCSI CDROM
- MATROX 3D with 4MB SGRAM
- Monitor Sold Separately
- Windows 95

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Product Information Number 236

MULTIPLAYER GAMING

DWANGO Ditching Internet routers altogether, DWANGO is a Wide Area Network that promises luscious low latency via a grid of dedicated servers. For this superfast response, you pay $7.95 monthly for five free hours; 10 more cost $19; 20 more $34; 40 more $59. Membership is effectively limited by your proximity to one of 24 local dial-up numbers. Game lineup is stuck in 1996: You get *Doom*, *Doom II*, and *Duke*, but no *Quake*. *What you need:* gaming software, DWANGO client, 28.8 modem, 8N1 server dial up. *www.dwango.com*

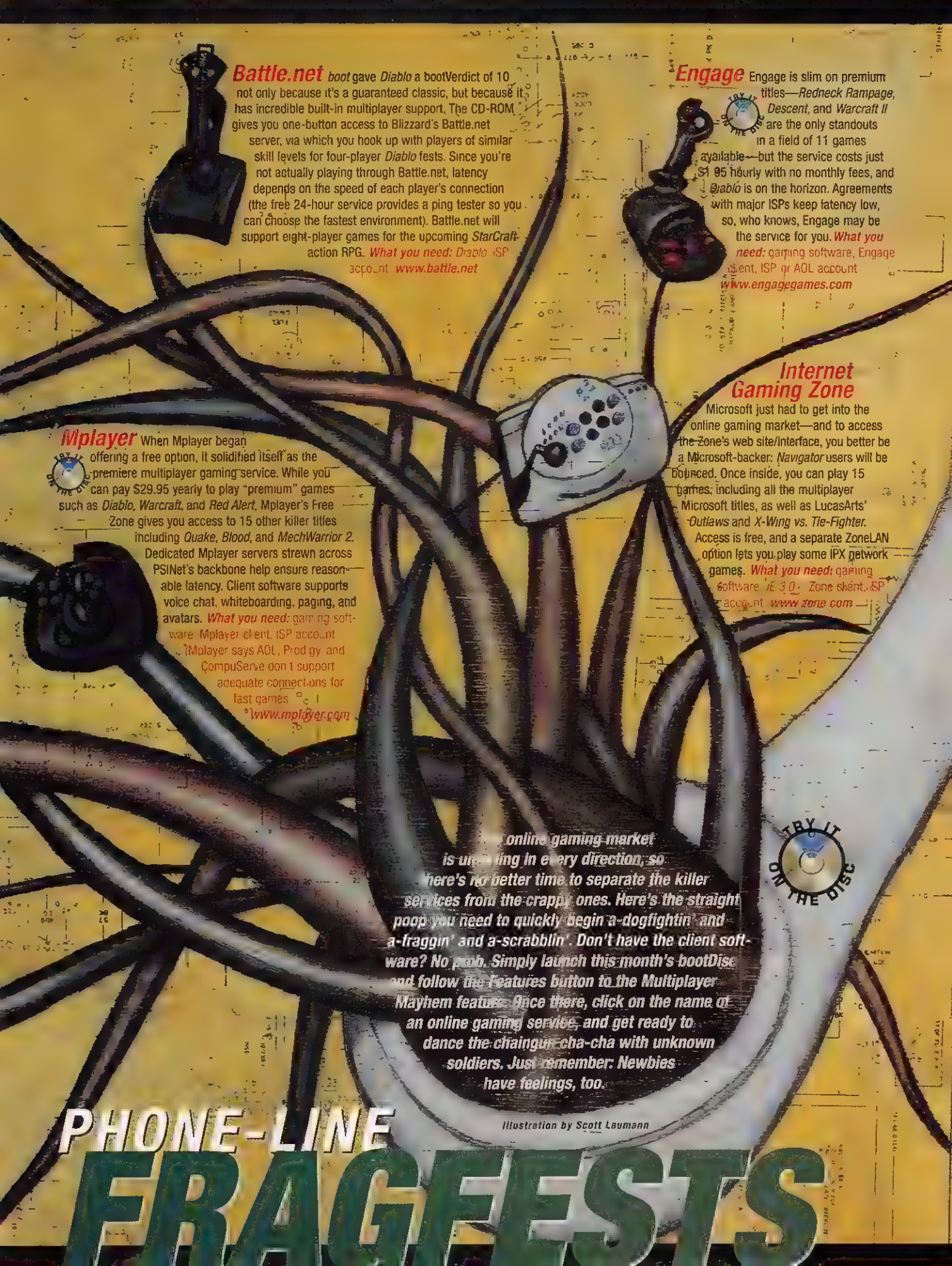
HEAT Still just in beta, HEAT's interface is a Java-enabled web site that lists member rankings, and hosts member web pages and chat. The HEAT Katalyst client lets you play exclusive SegaSoft games, as well titles designed for IPX network action. For reduced latency, you can subscribe to the WebBullet Internet service. Beta play is free, but come September, when HEAT officially launches, you'll pay $5.95 monthly or $49.95 yearly. *What you need:* gaming software, Netscape 3.0+ or Internet Explorer 3.0+, Katalyst client, ISP account. *www.heat.net*

Bezerk Once you download and install the Netshow game engine on your computer, you can go to the Bezerk web site and play entirely new games of *You Don't Know Jack* (a *boot* favorite) every Monday and Thursday. There are no reg fees, and you don't even need the original *Jack* CD-ROM; the Berkeley Systems web site makes money by pushing you ads in between game screens. Netshow is a category-creating Internet game, but it's only multiplayer insomuch as two people can play off the same keyboard. *What you need:* Netshow client, Netscape 2.0+ or Internet Explorer 2.0+, ISP account. *www.bezerk.com*

Kali Kali is slow, but its technology can support any game coded for IPX network action. The service currently supports 58 titles, including *Diablo*, *Redneck Rampage*, and *Interstate 76*, and slower-paced diversions such as *Links LS*, *Battleship*, and *Virtual Pool*, which are much more forgiving of latency problems. Kali costs just $20 for lifetime access to more than 600 worldwide servers (unregistered software lets you play free for 15 minutes before you have to relaunch the app). Client software updates are freely and frequently posted online. *What you need:* gaming software, Kali client, ISP account. *www.kali.net*

Total Entertainment Network With support for *Duke Nukem*, *Diablo*, *Blood*, *Quake*, *Shadow Warrior*, and seven other games, Total Entertainment Network boasts a good lineup. Hell, you even get your own e-mail account and special paging functions to call friends to battle. Unfortunately, TEN costs anywhere between $9.95 and $19.95 monthly. Still, you may find that TEN's proprietary Data Reduction Transfer technology really does reduce latency—try it out during your five-hour free trial period. *What you need:* gaming software, TEN client, ISP account. (TEN will set you up with the Concentric ISP for even faster access) *www.ten.net*

QuakeWorld You don't need a big commercial service to play multiplayer *Quake*—the experience can be as libertarian as tapping into a local QuakeWorld server run by some acne-scarred teenager. Id freely distributes the client and server software for Internet play. Even better, you also get Q-Spy, which lists active QuakeWorld servers in order of their relative latency and notes the map being played on each server, and how many players are currently fragging (the servers max out at 16 players). *What you need:* *Quake*, QuakeWorld client, Q-Spy, ISP account. *www.idsoftware.com*



Battle.net

boot gave *Diablo* a bootVerdict of 10 not only because it's a guaranteed classic, but because it has incredible built-in multiplayer support. The CD-ROM gives you one-button access to Blizzard's Battle.net server, via which you hook up with players of similar skill levels for four-player *Diablo* fests. Since you're not actually playing through Battle.net, latency depends on the speed of each player's connection (the free 24-hour service provides a ping tester so you can choose the fastest environment). Battle.net will support eight-player games for the upcoming *StarCraft* action RPG. ***What you need:*** *Diablo* ISP account ***www.battle.net***

Engage

Engage is slim on premium titles—*Redneck Rampage, Descent,* and *Warcraft II* are the only standouts in a field of 11 games available—but the service costs just $1.95 hourly with no monthly fees, and *Diablo* is on the horizon. Agreements with major ISPs keep latency low, so, who knows, Engage may be the service for you. ***What you need:*** gaming software, Engage client, ISP or AOL account ***www.engagegames.com***

Internet Gaming Zone

Microsoft just had to get into the online gaming market—and to access the Zone's web site/interface, you better be a Microsoft-backer: *Navigator* users will be bounced. Once inside, you can play 15 games, including all the multiplayer Microsoft titles, as well as LucasArts' *Outlaws* and *X-Wing vs. Tie-Fighter.* Access is free, and a separate ZoneLAN option lets you play some IPX network games. ***What you need:*** gaming software, IE 3.0+, Zone client, ISP account ***www.zone.com***

Mplayer

When Mplayer began offering a free option, it solidified itself as the premiere multiplayer gaming service. While you can pay $29.95 yearly to play "premium" games such as *Diablo, Warcraft,* and *Red Alert,* Mplayer's Free Zone gives you access to 15 other killer titles including *Quake, Blood,* and *MechWarrior 2.* Dedicated Mplayer servers strewn across PSINet's backbone help ensure reasonable latency. Client software supports voice chat, whiteboarding, paging, and avatars. ***What you need:*** gaming software, Mplayer client, ISP account (Mplayer says AOL, Prodigy, and CompuServe don't support adequate connections for fast games.) ***www.mplayer.com***

The online gaming market is unraveling in every direction, so there's no better time to separate the killer services from the crappy ones. Here's the straight poop you need to quickly begin a-dogfightin' and a-fraggin' and a-scrabblin'. Don't have the client software? No prob. Simply launch this month's bootDisc and follow the Features button to the Multiplayer Mayhem feature. Once there, click on the name of an online gaming service, and get ready to dance the chaingun cha-cha with unknown soldiers. Just remember: Newbies have feelings, too.

Illustration by Scott Laumann

PHONE-LINE FRAGFESTS

12-STEP

DEALING WITH YOUR **PC OBSESSION** DAY TO DAY BY BREAKING IT DOWN INTO 12 **EASY** STEPS

Setting up your own Webcam

Cameras monitor you every day, everywhere you go. At the bank, at the supermarket, even at the fast-food chain's drive-up window. Now cameras spy on you at bus stops and even in your own office! People love to watch. Voyeurism is exciting and dangerous, just the thing to get the adrenaline pumping through your veins. You've seen pages on the web with video cameras on everything from fish tanks to growing grass to unaware office workers. Now we give you the knowledge to put your own video camera to useless work, er... we mean artistic expression.
— Daevid Vincent

1. Get yourself a server

First and foremost, you will need a computer dedicated to gathering images and FTP'ing them to your web site. It doesn't have to be anything fancy, so long as it has a PPP connection to the net. Obviously, sound is not needed.

An old 486 will do nicely, or you can leave your regular machine on all the time. If you're really clever, you could set this machine up as a mass-storage server using Ethernet cards, but that's another 12-Step altogether.

2. How do I get a picture?

Deciding on a camera is the next step. Anything that will connect to a standard Windows video-capture device driver is acceptable. Some video cards, such as the ATI TV cards, allow various composite/S-VHS inputs if you have a video camera. Theoretically, you could just broadcast a TV show or a pre-recorded videotape, but what fun is that? One popular brand is the good ol' Connectix camera. This is what we'll use for our demonstration.

3. You don't even have to open the case

The Connectix camera is a simple connection via the parallel port (be warned, there is NO pass-through) as well as the keyboard port (PS/2 male plugs into the computer, the large DIN pass-through plug is for your keyboard). You may need some adapters.

4. Install the drivers

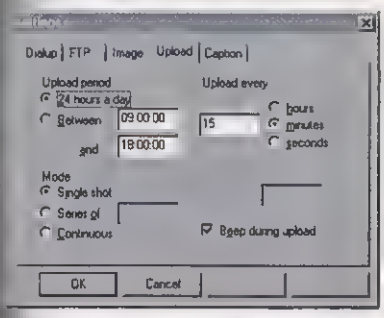
Run through the install of the Connectix camera software. You won't be using the applications after you're up and running, but you'll need the Connectix driver later.

You may wish to go to their web site **www.connectix.com** to get the current drivers.

5. From Point A to Point B

Since you probably are not running your own Internet server and you have a dial-up account somewhere, like the rest of us, you're asking, "How do I get the image onto the web page?"

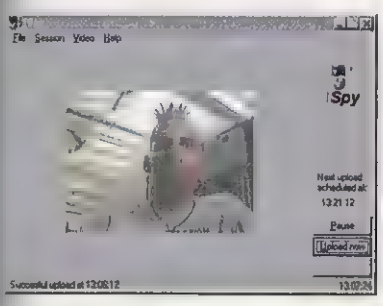
Good question. The best program we've found is shareware called *ISpy* (**www.ispy.nl**). It will FTP the image you've captured to a specified URL at predefined intervals. You can even put a date/time caption superimposed over the images.



6. T-6 and counting...

Check to make sure you have a live picture by running *ISpy*, and click on the Upload Now button (or the utilities included with the Connectix camera). The program should start a PPP connection using your existing settings; log on, dump the picture where you told it to, and log off. It all occurs seamlessly without your grubby lil' hands touching it.

At this point, if you don't have a picture, make sure you have the parallel port enabled in the BIOS as bi-directional and that Win95 recognizes it. If you used adapters or gender changers, be sure that they pass all the lines through. Some don't and could hose your image.



12-STEP

7 Set it up

Now you need to configure and automate the whole process: Go through the *ISpy* Settings menu and make sure you've filled in all the appropriate fields under each tab.

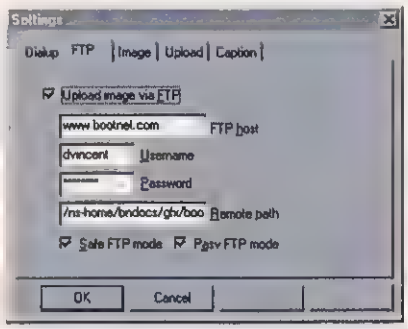
Under the FTP tab, put in the URL of your home page sans the directory information, for example: **www.bootnet.com**

The remote path is the exact directory tree and filename from the root on the server. In this case, it's: **/ns-home/bndocs/gfx/bootlive/dvincent.jpg**

The Image tab contains the name of the local file the program will save on your hard drive: **C:\html\boot_www_site\gfx\bootlive\dvincent.jpg**

And the Upload tab determines how frequently to upload. Fifteen minutes should be the minimum duration to upload your image, otherwise even the fastest machines will choke on the constant barrage of uploading it experiences.

Tweak the Source & Format options under the Video menu to get the optimum picture quality. The parameters available will depend on your driver, but all should have options such as brightness, contrast, tint, etc. It would behoove you to do this with a browser open to see what the rest of us are going to see.



8 Can my mom see mold in my bathroom?

You now need to create a web page that displays whatever it is you're pointing the camera at. This is accomplished just like any other page and JPEG image. Essentially, you want to put the following line in some web page you designed:

<IMG SRC="http://www.bootnet.com/gfx/bootlive/dvincent.jpg" ALT="bootLive: Daevid 'Web Goth' Vincent" HEIGHT="180" WIDTH="240"> Substitute the tags with the appropriate values for your page.

9 Can you see this yet?

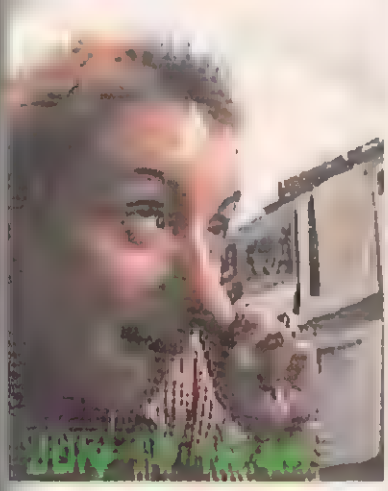
Of course you'll need to upload the page you just created and make it world readable, along with the image. On Unix machines this is accomplished via the "chmod 0644 bootlive.html" command in a telnet shell account or via your FTP program. Other servers don't have permission bits, so you don't need to set them. Do the same for the .jpg file that you uploaded in Step 7. This is important, because otherwise, the world won't be able to see your smiling face. Wouldn't that be a travesty?

10 Yeah, it works, but it ain't changin'!

This may be a problem beyond your control. Some ISPs cache pages to help reduce the load on the hard drives and speed delivery to browsers. The server may not check the images as often as you would like, and unfortunately, the ISP may not be willing to disable caching on their server just to accommodate your sea-monkey cam, no matter how fabulous you think it is.

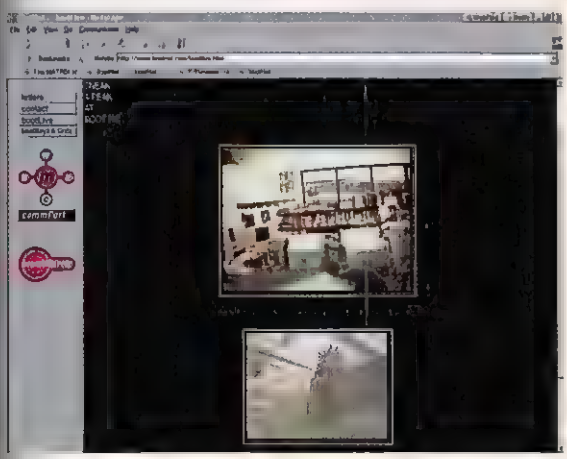
11 Danger! Danger! Wil Robinson

Just a friendly warning: you are now broadcasting images every 15 minutes to the entire online world. It is incredibly easy to forget it's on, and the camera is nondiscriminatory, it will take pictures of you picking your nose just as easily as it will you having an affair with a guy named Steve. Unless you're an exhibitionist, don't walk around your apartment in your birthday suit or light up that spleef in its view. Be careful, we're all watching!



12 Mine's better than yours!

For a final working version, as if you couldn't spit in the air and have it land on a web camera these days, check out **www.bootnet.com/bootlive.html**. We have two cameras. This is a simple example of how interesting or not we bootBoyz can be!



Bad Parenting

I recently upgraded my Cyrix 686 P200+ system from 16MB to 128MB of EDO RAM. To my dismay, the bootMark benchmark scores decreased drastically. Please tell me what's going on here. My system has 512K L2 cache, Award BIOS, and a Rendition-based 3D video card. Help!

Issac Nelson

Technical editor Chris Dunphy replies: *I bet you have an Intel 430FX, 430VX, or 430TX chipset on your motherboard. These chipsets support 128MB of RAM (or 256MB in the case of the 430TX), but due to some boneheaded engineering on Intel's part, only 64MB are cacheable. If you drop back to 64MB, your performance should return as your cache kicks in again.*

Among Intel's Pentium chipsets, only the 430HX supports caching with a full load of RAM onboard. Pentium Pro and Pentium II chipsets don't suffer from these cache limitations, and neither do most of the non-Intel chipsets from ALi, SiS, or VIA. Blame your problems on Intel's short-sighted thinking that consumers would never need more than 64MB in their systems.

Remember, it wasn't too long ago that Intel told us 640K was more than we would ever need.

"Blame your **problems** on **Intel's** short-sighted thinking that consumers would **never need** more than **64MB** in their **systems**."

Recurring Nightmare

In *boot* 11, Andrew Sanchez reviewed the Gateway 2000 G6-266M. I ordered the G6-233M, which has the same video and audio cards. Andrew mentioned various problems with the computer: 1.) The audio card wasn't properly configured for Sound Blaster compatibility. 2.) The STB Vision Drivers were not utilized. 3.) No VESA 2.0 support. 4.) No real-mode drivers. 5.) Lack of bus-mastering on the CD-ROM. Can you tell me how to correct these oversights by Gateway? I'm computer-literate, but I need a little guidance.

John Walther

Hardware editor Andrew Sanchez replies: *The 266M suffers from all-too-common ailments (when will manufacturers begin shipping systems tuned for optimal performance?). Here are the fixes.*

1.) Sound Blaster compatibility. Check in your System Properties to ensure legacy support is installed. There should be an ENSONIQ AudioPCI Legacy Device icon. If not, you'll need to re-install the card's drivers (which also installs the DOS TSR program required for DOS compatibility). In your Gateway 2000 support software, you should have some Ensoniq sound card diskettes—seven to be exact. If you plan to re-install the drivers, it's best to remove all your old ENSONIQ drivers first.

2.) STB Vision Drivers not utilized. Check in your software bundle and find the STB Vision 95 driver disk. Go to Display Properties and change your STB drivers (no Vision Drivers utilized) to "STB drivers with Vision 95" support. When asked, put your STB floppy in the drive and install away. Once you've installed the Vision drivers, you'll see a little applet on the bottom right corner of your desktop.

3.) No VESA 2.0 support. There are a couple of ways to fix this. First, you can use Scitech Software's Display Doctor *to get VESA 2.0 support. Point your browser to* **www.scitechsoft.com** *for a shareware version of this invaluable video card utility. It will autodetect your video chipset and add VESA 2.0 support (if your chipset is supported by the software). Second, you can go to* FastVid's *site (***web.inter.nl.net/hcc/FastVid/***) and download the following: S3SPD310.TXT, S3SPD310.ZIP, S3VBE20.TXT, S3VBE317.ZIP. This is a shareware VESA 2.0 driver for S3-based chips, and speeds up DOS apps using VESA 2.0 video modes.*

*4.) No real-mode drivers. For the CD-ROM drive, go to Mitsumi's web site (***www.mitsumi.com***) and download the latest drivers: IDE155.exe (it should be an EXE file that's used for all of Mitsumi's CD-ROM drives). The installation program will configure your CONFIG.SYS/AUTOEXEC.BAT file for proper CD-ROM operation in DOS mode.*

5.) Lack of bus-mastering on the CD-ROM. If you're using OSR/2, go to System in the Control Panel, double-click on your CD-ROM drive, and look at your settings—if DMA isn't checked, then do so now. You'll have to restart your computer, but after that, you'll be bus-mastering away.

Playing the Numbers Game

I want to get the frame rates from all my favorite games and then compare them to how well they run after I upgrade my computer. The *Quake* bootMark thing is on the right track, but I'd like one that I could use for *Doom* and *WarCraft 2*, and so on.

Micah Gooch

Hardware editor Andrew Sanchez replies: *We don't know of a single utility that tests frame rates in every game, but many BUILD-based games—such as* Duke Nukem 3D, Blood, Shadow Warrior, *and* Redneck Rampage*—have built-in frame counters. So do* Doom *and* Hexen. *Check web sites for the codes you'll need to enter once you're in each game. Other DOS games you'll want to test include* Wing Commander III *and* IV. *For Win95 games,* MDK's *PerfTest is a great DirectX/floating-point test, while LucasArt's* Outlaws *gives your frame rates via codes. Even the horrid* Rebel Moon Rising *has a frame counter, if you plan to test MMX frame rates.*

Your 3D Gameplan

I have no freakin' idea how to upgrade my graphics card, a Cirrus Logic 542x ISA. I'm willing to spend up to $200, and I figure I can go in one of two directions: Buy a 2D/3D combo that will last me for a while (and then add a better 3D card), or buy separate 2D and 3D cards right now. What do you suggest and which card(s) do you prefer in each scenario?

Also, is this a good time to buy cards? What's your overall graphics strategy recommendation?

Ali

Technical editor Chris Dunphy replies: *Egad, what an old chip! Before you invest in a new 3D graphics accelerator, make sure you have enough machine to drive it. If you don't have at least a P-100, 3D acceleration won't help.*

If you are indeed in the market for a new graphics card (and not an entire new system), this fall will be a good time to shop; a whole new wave of 3D technologies will be hitting market. Given your budget, you should go for a combo 2D/3D card. Hybrids based on the Nvidia Riva 128 chip look to be darn slick, as do cards based on the Permedia 2, the ATI Rage Pro, and the next-generation Rendition Vérité 2200. All should be coming in at less than $200.

As for an overall graphics strategy: Figure out which cards have the features you desire, look to boot *for rankings, and then buy the best you can afford. Remember, if we call it "Kick-Ass," it does.*

Searching For a 60

Do you know where I can find a Pentium 60 motherboard? I looked at a local computer show, but to no avail. Why are Pentium 60 motherboards so hard to find? Why don't they make Pentium motherboards that can support all the CPUs?

Michael

Hardware editor Handy Andy replies: *Nobody is making P60-compliant motherboards because Intel's not making P60 processors anymore. Its lowest-line processor is now the P75.*

When Intel decides to drop a processor design, every motherboard manufacturer follows suit, and drops support. So, it's a simple case of supply and demand. It would be like designing a P-II motherboard with backward compatibility with the 486: It may be technically possible, but why should you do it?

If you're really stuck on getting a P60 motherboard, try searching all the computer hardware stores you can for close-outs and discontinued stock.

"THOSE PUNDITS WHO SAY NETSCAPE IS THE NET'S KILLER APP OBVIOUSLY DON'T GIVE A DARN ABOUT PLAYING GAMES ONLINE. IF THEY DID, THEY'D KNOW THAT KALI HOLDS THAT TITLE. WITH A RIDICULOUSLY LOW REGISTRATION FEE, LIFETIME UPGRADES, AND FREE PLAY ON KALI SERVERS, THERE'S NO REASON EVERY GAMER IN THE FREE WORLD SHOULDN'T PICK UP THIS AMAZING SHAREWARE PROGRAM."

STEPHEN POOLE, GAMESPOT

"THE TECHNICAL ASPECTS OF KALI ALONE ARE ENOUGH TO EARN OUR AWARD [CG PREMIER AWARD]. BUT THE LOW PRICE, FREE UPGRADES, AND UNLIMITED PLAY CEMENT THE DECISION. HATS OFF TO CREATOR JAY COTTON."

MAY 97 ISSUE, COMPUTER GAMING WORLD

AND WHO SAYS YOU'LL NEVER AMOUNT TO ANYTHING BY PLAYING GAMES?

"LIKE MANY OF US, JAY COTTON JUST WANTED TO PLAY DOOM. NOW HE FINDS HIMSELF AT THE CENTER OF A FULL-FLEDGED GAMING REVOLUTION. HE IS A MOSES LEADING GAMERS TO THE PROMISED LAND OF HEAD-TO-HEAD GAMING, A CHE GUEVARA FREEING THEM FROM THE SHACKLES OF SUBSCRIPTION GAMING SERVICES."

T. LIAM MCDONALD, BOOT

"KALI IS THE ONE SERVICE IN THIS REVIEW THAT IMPRESSED US THE MOST.... LOTS OF PLAYERS, LOTS OF GAMES, GOOD PERFORMANCE, AND A DIRT-CHEAP, ONE-TIME CHARGE. WHAT MORE COULD YOU ASK FOR IN AN ONLINE GAMING SERVICE?"

MICHAEL E. RYAN, PC MAGAZINE

"KALI . . . MAY BE THE SYSTEM THAT PUTS THE BIG-NAME GAMING NETWORKS OUT OF BUSINESS."

APRIL 1997 ISSUE, PC GAMER

KALI

130,000 USERS. 500 SERVERS. 54 COUNTRIES. 60 GAMES. THE BEST MULTIPLAYER GAMING ON THE NET.

WWW.KALI.NET

Product Information Number 185

Security Alert

It has come to my attention that a flaw in Microsoft's TCP/IP protocol has left a hole in Internet security.

Microsoft is aware of the problem, but I haven't read about this in your magazine, or seen any info on your web page. The problem is with OOB (Out Of Band) messages being sent to people while they are logged on to chat servers or in online games such as *Diablo*.

This OOB message, if sent by a malicious person, can cause your computer to display a fatal exception error in Win95, and you won't be able to use your Internet connection again until you reboot. In WinNT, this will lock up your machine and cause you to reboot. This is an annoyance most of the time, but if your computer locks up or reboots, this can cause problems.

Microsoft has released a hot fix for the problem, but this fix is not 100 percent effective. You can use a port sniffer to monitor the port where the OOB message is sent and decode the sender's IP Address or Host Address from the OOB packet header. A hacker can modify that address and make it harder to track. This OOB attack can be leveraged not only against users, but also against servers.

The file name of the fix is vctpupd.exe and it can be found in the Microsoft Security area of the site. You can also find a fix for the hole for WinNT there.

The Helper

Pulled Over for P-II Overclocking

In querying many different P-II motherboard vendors, it's proven difficult (if not impossible) to determine if any given system clock can be increased.

ZIF Socket 7 motherboards, such as the Shuttle Hot-565 can have the system bus adjusted to 83MHz... then you can adjust the clock multiplier to get to the CPU core speed.

On P-II systems, all you can do is adjust the clock multiplier (based off the 66MHz system bus). And there are applications that require the faster system bus (and therefore the PCI bus @ 0.5x) to run faster, for faster CPU throughput.

Are you aware of any P-II motherboards which can increase the system bus speed?

I understand that the 440LX chipset coming this fall will support the AGP 100MHz system bus. I guess I'll have to hold off until then. It's disappointing that Unix workstations such as the SGI O2 can run the PCI bus at its rated speed of 133MHz, but the PC market doesn't come close.

Dave Merritt

Technical editor Chris Dunphy replies: *Applications that require a faster bus? We're not aware of any P-II motherboards that allow overclocking past 66MHz yet, but they'll surely be available before long. If you're feeling really adventurous, you may be able to solder a new clock crystal onto a motherboard. (Although waiting for the 440LX may be smarter than soldering around on your board.) Overclocking past 66MHz is electrically really complicated, so it would be wise to only trust your data to a motherboard that's been tested at a faster speed—otherwise bad things could happen. Also, running the PCI bus at faster than 33MHz can cause some cards to fail and lose data. As far as that 133MHz PCI bus speed, check your facts before you fault the PC. The PCI spec allows for 32-bit or 64-bit data width, and a 33MHz or 66MHz bus. The SGI O2 (and all other PCI-equipped SGI systems) features a 64-bit wide PCI bus running at 33MHz. PCs run at the same speed, but use a 32-bit wide bus. As far as I know, no one has begun to use a 66MHz PCI bus yet, though AGP is actually a variant of that. Check out* boot *12's White Paper about busses for more information. I think you got your incorrect 133MHz figure from the maximum speed of at 32-bit 33MHz PCI bus, which is 132MB/sec.*

> *"If you're feeling* ***real adventurous****, you may be able to* ***solder*** *a new clock* ***crystal*** *onto a* ***motherboard****."*

How To Slow Down Your Software

I've been playing *Ultima VII* and it runs too fast for me. Is there some software I can get to slow it down?

Grant

Tech editor Chris Dunphy replies: *Software running too fast? That's a rare complaint! Have you considered overclocking your brain to keep up? If that fails, we've tracked down a utility on the net call* MoSlo *that throttles your CPU to aid in running older games that were written with brain-dead timing routines. You can find it at* ***ftp://ftp.pc.ibm.com/pub/pccbbs/dos_util/moslo12.zip****. (Or check on the* bootNet.*)*

Let this be a lesson to game developers: Sloppy code and bad assumptions today may come back to make you look stupid tomorrow.

High-Speed Buses

I read in *boot* 11 (where? TK) that the new breed of video cards is going to be running SDRAM at a speed at 133MHz up to 206MHz. Is that just the chip speed or the bus speed? Are the new AGP buses going to run at the same speed as the chipset?

It also said that one new card is going to put out 100fps. And on one of the cards it said that it was going to have 12K of onboard cache. Is this going to speed up the fps on this card? In the new computers are they going to put a new bus on the motherboards coming in 1998? When are they going to bypass the x86 architecture and start making the applications on a new architecture?

Michael L Burns

Tech editor Chris Dunphy replies: *The speeds you're referring to are the speeds at which the graphics chip talks to its onboard memory. The fastest boards available now max out talking to 100MHz SGRAM, but over the course of the next year SDRAM speeds may double. AGP, on the other hand, runs at either 66MHz or 133MHz, referring to the speed that the graphics card can talk to your main memory. AGP is a new bus, and future motherboards will likely sacrifice a PCI or an ISA slot to provide an AGP slot.*

Overclocking

About your 12-steps to overclocking your PC (*boot* 11)... I tried it, and successfully boosted my Pentium from 60MHz to 66MHz! I noticed a small change, which was great. But it also mentioned something about bumping up the multiplier...

It said if changing the clock speed doesn't work, then try bumping up the multiplier a step from 1.5 to 2 or from 2 to 2.5. How do I bump up the multiplier?

Chorlo

Disc editor Sean Cleveland replies: *You need to check your motherboard's manual for specific jumper settings. Here's a handy little chart that describes which settings to use, showing all the possibilities known to us at this time. Enjoy!*

CLOCK SPEED	MULTIPLIER		BUS SPEED
Pentium 60	1	x	60 Mhz
Pentium 66	1	x	66 Mhz
Pentium 75	1.5	x	50 Mhz
Pentium 90	1.5	x	60 Mhz
Pentium 100	1.5	x	66 Mhz
Pentium 112.5	1.5	x	75 Mhz
Pentium 120	2	x	60 Mhz
Pentium 125	1.5	x	83 Mhz
Pentium 133	2	x	66 Mhz
Pentium 150	2.5	x	60 Mhz
Pentium 150	2	x	75 Mhz
Pentium 166	2.5	x	66 Mhz
Pentium 166	2	x	83 Mhz
Pentium 187.5	2.5	x	75 Mhz
Pentium 200	3	x	66 Mhz
Pentium 208	2.5	x	83 Mhz
Pentium 225	3	x	75 Mhz
Pentium 233	3.5	x	66 Mhz
Pentium 250	3	x	83 Mhz
Pentium Pro 166	2.5	x	66 Mhz
Pentium Pro 200	3	x	66 Mhz
Pentium Pro 233	3.5	x	66 Mhz
Pentium Pro 266	4	x	66 Mhz
Pentium II 200	3	x	66 Mhz
Pentium II 233	3.5	x	66 Mhz
Pentium II 266	4	x	66 Mhz
Pentium II 300	4.5	x	66 Mhz
Pentium II 333	5	x	66 Mhz

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GameSlice Weekly

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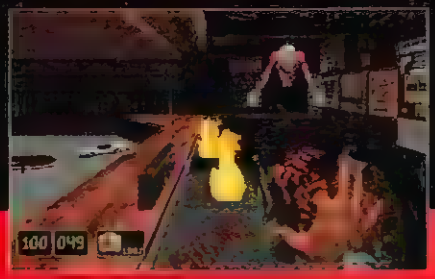
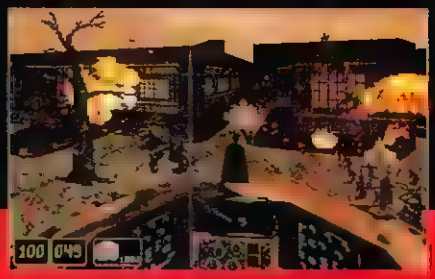


Rotating 3D gun turrets to mow down enemies



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Product Information Number 155

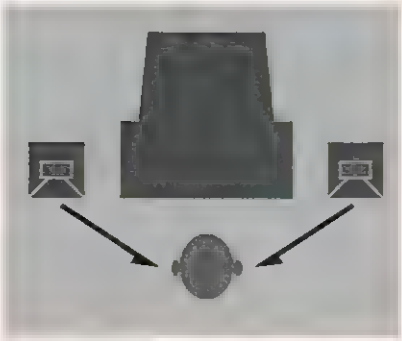
YOUR PERSONAL TECH **BRIEFING** ON THE **CONCEPTS** AND **COMPONENTS** THAT MAKE UP THE **PC** EXPERIENCE

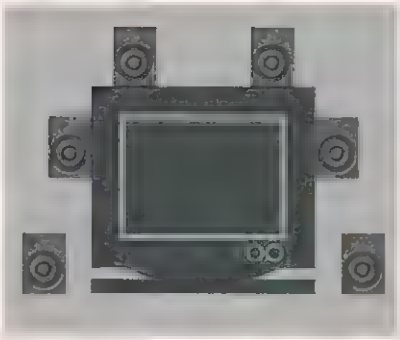
this month:

Optimizing Your Sonic Experience

When's the last time you checked your speaker placement? Do shamblers sound like they're growling in your lap, despite the fact that you can't see them on screen? Hellfire missiles explode with the impact of flatulence after a hearty chili cook-off? Well then, you've been the victim of improper sonics. With DirectSound3D making its rounds in this season's hottest games, poorly positioned speakers and a misunderstanding of how acoustics works threaten total immersion. We have the cure for your sonic ills.

— Andrew Sanchez





SATELLITES OF LOVE

Finding your own personal Acoustic Avalon is as simple as chanting this mantra: Speaker placement.

If your speakers are placed on the surface of your desk, take a second and notice where they're aimed. Misdirected sound can rob you of the sound quality you invested in when you bought those killer speakers. From the center of your monitor, measure 10 to 12 inches out and place the speaker, facing straight forward. If you draw an imaginary line between both speakers and your head, each speaker should be equidistant from your head. (See top diagram.)

In a perfect world, sound should be coming in at ear-level. Unfortunately, many satellite speaker designs aim dead-on forward, with barely any upward angle. If your satellites came with angled mounting brackets, such as those with Cambridge SoundWorks' cubic satellites, install them and aim them upward. Also try raising the satellites higher, bringing them closer toward ear-level or, if the satellites are shielded and are small enough, try them on top of your monitor. (See bottom diagram.)

While the home and car audiophile have enjoyed advances in sound design over the years, only within the last couple of years have computer/multimedia speaker systems enjoyed the taste of killer bass.

Here are some of the more common designs, along with their respective benefits.

SEALED

A woofer is loaded into a sealed box, creating trapped air pressure inside the box, which helps control cone movement. A well-designed enclosure should not have any extemporaneous air leaks, as this dramatically decreases sound output due to out-of-phase output mixing with the main woofer output. Despite the apparent ease of design and manufacture, designers must be careful to design the enclosure around the acoustic properties of the woofer. A box that's too small will limit cone movement and compromise low-end frequency response. This is a common problem with many inexpensive multimedia speaker solutions. Sealed boxes tend to get pretty large in order to produce deep, rich bass.

PORTED

Also known as a "vented" enclosure, the ported enclosure employs a rectangular or tubular vent tuned to a specific frequency and mounted in the woofer box on one of the enclosure's faces. This is one of the rare instances when a hole in the speaker enclosure is intentional. When air is forced through the vent, the vent resonates and adds output, which is then reproduced from the vent rather than the woofer if there are bass notes of that specific frequency. For example, if a vent is tuned to 60Hz, and a 60Hz signal is fed into a properly designed ported box, practically all the output will come from the vent rather than the woofer, resulting in greater efficiency at that frequency.

The bottom line: You get louder bass tones at the vent frequency. The big problem with vented design is that playing frequencies below the tuned frequency results in the woofer violently moving out of control—a situation known as "unloading." This will eventually destroy a woofer, although many modern ported subwoofer systems use a subsonic filter that kills extemporaneous ultra-low frequencies.

BANDPASS (SINGLE OR DUAL-REFLEX)

This is a box-inside-a-box scenario where the woofer is mounted in either a sealed or ported enclosure. This enclosure is in turn mounted inside another vented enclosure, resulting in the woofer firing into another chamber. A bandpass box with a single tuned vented chamber is referred to as a single-reflex bandpass, and a box with both chambers tuned (usually an octave apart) and vented is known as a dual-reflex bandpass.

Both designs use a combination of tuned ports and mass loading to control woofer response. With the additional air mass trapped in front of the woofer working in tandem with the rear air mass, excursion is tightly controlled over a wide spectrum.

Bandpass enclosures are louder and more efficient than other boxes per given wattage, while the vent(s) act as a natural filter, killing unwanted sound above and below the enclosure's frequency spectrum. The only misfortunes that plague this design are the ease with which you can overdrive the woofer without hearing any problems until it's too late. Also, sonic response above and below the box's frequency response is greatly diminished.

MAKING YOUR SUBWOOFERS HOWL

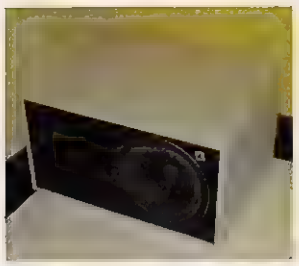
Does the sound of exploding grenades fail to shake your house to its foundation? Woofer placement is the most important element in putting the boom back in your game. Here are some helpful tips and tricks that will get your neighbors angry in no time.

DON'T: Place your woofer in a free-standing position. Bass dies without a little reinforcement from the surrounding environment.
DO: Make your room work for you! Subwoofer boxes gain volume when low-frequency energy is forced to interact with your room's architecture. To this end, try placing your woofer in any of the positions shown below to help reinforce bass response.

Positioning the woofer against a wall will reinforce bass with the help of one rear wall and the floor. If your woofer is vented toward the rear, leave at least a three- to four-inch gap between the box and wall, to keep from blocking the vent and changing its acoustics.

Facing the woofer toward the wall affects the bass. Not only is output reinforced by the wall, but the wall adds mass in front of the woofer and stiffens the cone, resulting in tighter control and the woofer is less likely to bottom out. Cone noise is also greatly reduced because the woofer is facing away from you. Many free-standing subwoofer designs employ a bottom-firing woofer for this reason.

The second best position for your box is what sound aficionados call "corner loading," where the corner acts as an extended baffle for the woofer, reinforcing bass response. This time though, two walls help deliver maximum boom for the buck.



This variation of corner loading is probably the best. Firing your subwoofer's output into a corner not only gives you all the advantages mentioned above, but the corner will act as a horn, further reinforcing bass response. Because the woofer is firing into the wall, you'll also get cone stiffening and reduced noise. Placing the box flat against the wall and firing the woofer into the corner, leaving a four to eight inch gap in front, is another variation of this idea.

FINE TUNING THE BIG BOOM

The best way to optimize your bass response is to first set your woofer volume knob at anywhere from halfway to three-quarters power—don't max it out, this will cause distortion—and then start experimenting with positioning.

Crossover *A network of capacitors and coils, which electrically filter out unwanted frequencies. The crossover point is the exact frequency at which filtering and attenuation start. There are two types of crossover: A high-pass crossover only lets through frequencies above and including the crossover point; a low-pass crossover lets everything below the crossover point through. How fast the attenuation occurs depends on the type of crossover network.*

Total Harmonic Distortion (THD) *A percentage measurement that indicates how much noise, apart from the music/sound material, is reproduced when a speaker is cranked up. The lower the percentage, the better. When looking at this spec, pay attention to the THD of the woofer and the satellites---due to the human ear's heightened sensitivity around the midrange area, 10 percent THD on a woofer is barely noticable but 3 percent on a midrange or tweeter is highly audible.*

Out-of-Phase *Sound is a sine wave. When it encounters exactly the same wave at 180 degrees opposite, it is said to be "out-of-phase." When this happens, the sine wave is cancelled, meaning no sound for you! Out-of-phase situations include wiring a left speaker with the positive leads into the negative amplifer output, and any extemporaneous speaker-box air leakage.*

Frequency Response *Tells what frequencies an individual speaker or speaker system will reproduce. For an entire system, the theoretically perfect frequency response is from 20Hz to 20kHz. Realistically, most systems have a frequency response from 100Hz to about 10kHz. A speaker's frequency response can be broken down into four ranges of sound:*

1.) Bass: Ranging in frequency from 20Hz to about 100Hz, this is where all your low-frequency energy, from thunder to explosions, is centered. Freqencies below 20Hz are considered "subsonic" and are felt more than heard. This is what pushes on your chest and shakes the china from the shelves. Very important for simulating earthquakes, but don't expect any multimedia woofer to produce tones in this region. Due to the way humans perceive sound, bass requires the most power in order to match everthing else's output levels. Rule of thumb: allocate twice the power you pump to your mids and highs for your bass.

2.) Midbass: The range between 100Hz to about 300Hz. This is where the lower half of a man's voice and other warm sounds come from. Without proper midbass response, sound becomes hollow.

3.) Midrange: Between 300Hz to about 4000Hz, this is where the majority of sound energy is. From a woman's voice to a demon's scream, this range is important for realistic reproduction.

4.) Treble: From 4000Hz to 20000Hz. This is the range where cymbal crashes and hisses hang out. Without proper treble, your sound lacks sharpness, definition, and airiness. This area requires the least amount of energy, but is most succeptable to destruction by overpowering or distortion.

Signal to Noise Ratio (S/N) *Tells you how clean your output will be. Specifically, it tells you how far above the noise floor your sound will be. The farther away, the less you'll hear hissing, pops, and other noises. The higher your S/N ratio, the better.*

Overexcursion *When a speaker is driven with lots of input and its cone moves past the engineered movement limit, it's said to suffer from "over-excursion." This is dangerous because the speaker's voice coil literally jumps out of the magnetic gap that aligns the cone and controls the cone's movement. When the coil returns to place, there's a strong possibility that it (still conducting electricity) is striking the metallic side of the magnetic gap, causing a short circuit and destroying the speaker. This is the number one cause of speaker destruction. If you hear lots of distortion when you crank your speakers, ease up on the throttle.*

Sound Pressure Level *Measured in decibels, this is how loud a speaker system can get. The human ear needs an increase of three decibels in order to perceive an increase in loudness. To increase your system's output by three decibels, you must do one of two things: double your wattage power or double the number of speakers.*

Mass Loading *Placing an object in front of a speaker in order to alter its acoustic properties is called "mass loading" the speaker. The object can be anything from a wall to an angled piece of wood to trapped air in an enclosure.*

TAKE THE GALAXY BY FORCE.

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Product Information Number 105

Sizzling SCANNERS

EACH MONTH, **BOOT** EDITORS GATHER THE **BEST** PRODUCTS IN A SPECIFIC **CATEGORY** AND DEEM THEM: **BOOTWORTHY**

STUNNING HARDWARE RESOLUTION OF 1000X2000DPI CAN BE INTERPOLATED UP TO A COLOSSAL 10000X10000DPI THROUGH SOFTWARE DURING SCANNING

*Living life with your head inside a PC is fine—until you need an **analog** artifact from the real world: your first baby picture for the **ultimate** vanity site; an image of your home-fabricated 3D card for the blueprints you're selling to S3; even text from that rare foreign magazine (you're not going to retype all that crap, are you?). You need a **flatbed** scanner, friend, and there's never been a **better** time to step up to the glass. Low-end models are diving below the $200 mark, and high-end units are ready for prime-time prepress.*

Umax PowerLook 2000

The Umax PowerLook 2000 is the Cadillac of flatbed scanners. With a price tag that straddles the fence between pro-caliber and consumer-grade, this scanner's performance is strictly prepress-quality, and competes with the company's high-end Mirage line. 36-bit color depth means images with more than 68 billion colors. Maximum resolutions tower at 10,000dpi with software interpolation. These factors, combined with a 3.3 Dmax, give the PowerLook 2000 unbelievable detail, especially in the hard-to-reach shadow areas that frequently lose detail or color rendition.

This heavyweight (and we mean that literally; the unit weighs more than 20 pounds, and pushes 30 pounds with the transparency adapter in place) is a demon in the speed department. A 3MB I/O buffer catches image data pumped through a SCSI-2 interface to routinely kick out 4x5-inch 1,000dpi scans in less than a minute. The ability to scan directly to CMYK will save conversion time in your favorite image-editing app, as well as valuable chunks of gamut with the PowerLook 2000's smooth mapping.

While the program ships with a TWAIN-compliant plug-in for imports into image-editing apps such as Adobe *Photoshop*, the bundled *PhotoPerfect* software from Binuscan is impressive enough to make you stay home. The software employs artificial intelligence techniques to create pin-point accurate color-corrected images and razor-sharp on-the-fly unsharp masks. Gamma corrections can be performed globally, or for specific RGB channels (or even for specific CMYK channels in prepress mode).

If you've got the jingle, this cruiserweight should be patrolling your desktop, ready to serve all your scanning needs.

product info

Price $5,500
Company Umax
Phone 800.562.0311
URL www.umax.com

THE 8,000-ELEMENT TRILINEAR CCD IS A COLD CATHODE LAMP FOR BRILLIANT AND ACCURATE COLOR THAT DOESN'T SHIFT DURING HEAVY-DUTY SCAN SESSIONS

THE ABILITY TO SCAN DIRECTLY INTO CMYK MODE FOR PRESS REPRODUCTION SAVES LOST COLOR RANGE DURING CONVERSIONS, AND LOST HOURS FROM THE WORK FLOW

HP ScanJet 4c

30-BIT COLOR DEPTH DELIVERS SOME 1 BILLION COLORS—AND THIS TOP-OF-THE-LINE HP MODEL DOES IT IN STYLE, WITH 600DPI OF RESOLUTION

Hewlett-Packard has a well-earned rep for quality printers and scanners, and the ScanJet 4c is no exception. Coming in under the $1,000 mark (and commonly available in the $700 range), this workhorse motors on single-pass CCD that delivers 600dpi of hardware resolution that can be cranked up to 2400dpi through software interpolation. Scaling of documents—which can go up to 8.5x14-inches—can be set to range from 3% to 400% at the time of the scan. This all adds up to quality images that are suited for uses ranging from web pages to modest print jobs.

With a 4.56ms/line scan speed at 600dpi, the ScanJet 4c grabs images lickity-split. Our test 4x5-inch image was calibrated, previewed, and scanned at 600dpi in just over 30 seconds. Boom! And for web and FPO work, cranking down the resolution and color-depth will speed up the process dramatically. Simple scans require little more than 10 seconds!

While images can be acquired from within any OLE- or TWAIN-compliant app, the packed-in DeskScan II capture software will comfortably serve most casual users. Along with these goodies, the ScanJet 4c comes bundled with a bundle of a bundle. Kicking it off is Corel's *Photo-Paint* image-editing software. While nowhere near as robust as Adobe's offering, this package should suit most user's image-editing needs. But wait, there's more! If you order today, HP will also include Corel's *Web.Graphics Suite* authoring software, which includes the *Web.Designer* HTML editor, *Web.Transit* HTML importing utility, *Web.Move*, *Web.Draw*, *Web.World*, and *Web.Gallery*, a massive library of web-ready elements in the finest Corel tradition.

Your OCR needs are served by a limited edition of Caere's *OmniPage* software. Tossed in for good measure are *PaperPort* for HP by Visioneer, and HP's Copy Utility, which makes your scanner into a copy machine.

The ScanJet 4c tethers to your PC via a SCSI-2 connector, and comes with a passable SCSI adapter and drivers for ASPI and CAM-compliant cards.

product info

Price $960
Company Hewlett-Packard
Phone 800.724.6631
URL hpcc920.external.hp.com

30-BIT QUALITY AT A 24-BIT PRICE

OpticPro 9630P

ENHANCED PARALLEL PORT INTERFACE MEANS NO SCSI HASSLES AND HANDY NOTEBOOK PC COMPATIBILITY

Packing half the weight of other contenders in this contest, the 2.5-inch tall OpticPro 9630P weighs in at a svelte 11 pounds. But don't be mistaken—this lean, mean scanning machine packs some serious punch.

Coming at you with the kind of price tag you'd expect to find on some 24-bit slap-dash scanners, the 9630P delivers 30-bit color-depth for around 1 billion colors. Unless you're digitizing the next *National Geographic* cover, this spectrum should more than satisfy your scanning needs. Resolution-wise, the 9630P is no slouch either. Its 600dpi optical resolution is double what you might expect from a 24-bit price-competitor. And the resolution can be fine-tuned all the way up 9600dpi through software interpolation during scanning.

The software shipping with the scanner is nothing to write home about, but comes with stable TWAIN drivers for plugging into your image-editing app of choice. Also included is an OCR package and Plustek's own *Action Manager* for scanning, faxing, and copying images. A nifty detail is the handy button on the scanner itself that remotely launches the *Action Manager*. Fun stuff.

And put away that SCSI card. You won't be needing it with the 9630P. This flatbed connects to your desktop or notebook PC via an enhanced Parallel Port. While this means sacrificing some raw speed, you do get to enjoy a quick and painless set-up, and the ability to easily scan on the road. A versatile and affordable solution, indeed.

product info

Price $350
Company Plustek
Phone 800.685.8088
URL www.plustekusa.com

Microtek ScanMaker III

SHIPS WITH A GENUINE ADAPTEC ASPI-COMPLIANT SCSI CARD

The ScanMaker III from Microtek, the company's whose name is synonymous with flatbed scanning, boasts specs you'd expect from a unit costing two or three times more the price. With 26-bit color depth, the ScanMaker III differentiates even the most minute color variations. Nearly 70 billion color choices beat down banding like nobody's business, and the daylight fluorescent lamp resists color shifting.

Optical resolution clocks in at 600x1200dpi. (Mixed resolutions are created by uneven sampling rates of the horizontal and vertical motion of the CCD. For every two samples the head makes travelling horizontally, it only makes one travelling vertically). Resolution can be amped up to 4800dpi through software interpolation during the scan process. This generates sharp, saturated images in a single pass that are guaranteed to satisfy even the most discerning scan monkeys.

The ScanWizard TWAIN drivers are without doubt among the best in the biz, packing sundry prescan options. But what will you run the TWAIN drivers through? Tell 'em Johnny! Yes, the ScanMaker III ships with the full version of Adobe's *Photoshop*—the premiere image-editing app. Also in the stock box is a handy transparency adapter for sucking down slides. This is fine for creating FPOs or web images, but like any flatbed adapter, the ScanMaker can't compete with dedicated slide scanners.

Still, for grabbing images up 8.5x14-inches in size with bright brilliant saturated colors, the ScanMaker III has few competitors.

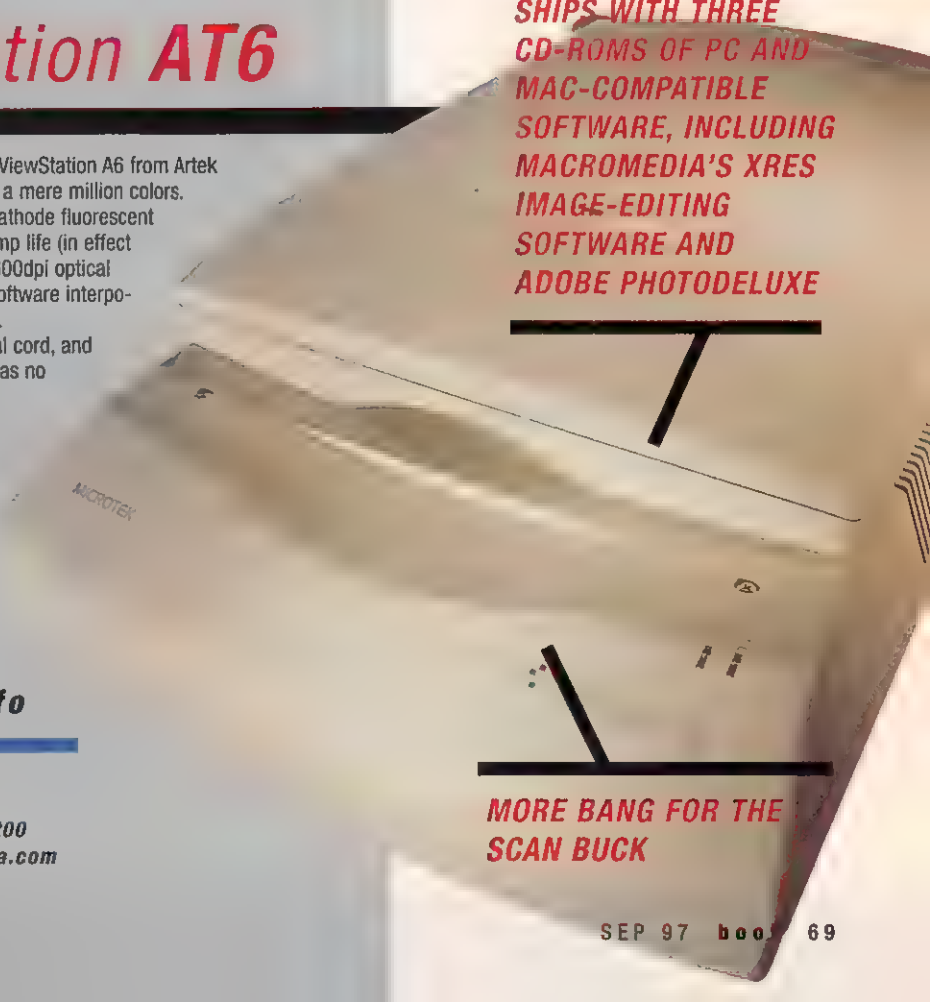
product info

Price $1499
Company Microtek
Phone 800.654.4160
URL www.microtekusa.com

YOU'D BE HARD-PRESSED TO FIND A BETTER 36-BIT FLATBED SCANNER WITH A PRICE TAG UNDER $2,000

Artec ViewStation AT6

SHIPS WITH THREE CD-ROMS OF PC AND MAC-COMPATIBLE SOFTWARE, INCLUDING MACROMEDIA'S XRES IMAGE-EDITING SOFTWARE AND ADOBE PHOTODELUXE



Like a beefier version of the Plustek OpticPro 9630P, the ViewStation A6 from Artek delivers a billion colors at a price you'd expect to pay for a mere million colors. This 30-bit single-pass scanner utilizes a long-life cold cathode fluorescent lamp to keep color temperatures accurate and extend lamp life (in effect reducing operating costs). The CCD captures detail at a 600dpi optical resolution, which can be revved up to 4800dpi through software interpolation. Images come in sharp, bright and ready for action.

Unlike the Plustek, the Artec feeds off a SCSI umbilical cord, and comes with a passable SCSI card. The SCSI-II interface has no problem keeping up with the flow from the scanner, and images arrive on-screen pronto.

In addition to a spartan multi-lingual printed manual, the ViewStation AT6 comes bundled with a flashy multimedia demonstration CD-ROM—complete with throbbing dance beat—that introduces users to all the features of the scanner. Also included in the bundle is Adobe's miserable *PhotoDeluxe* software, which can hopefully be upgraded to the 2.0 version due out soon. The real software that you'll be living with day and day out is on the third platter. Here you'll find Newsoft's *Wordlinx* OCR software, Artec's own *Ultima MediaHouse*, and Macromedia *xRes* (a very capable *Photoshop* alternative that works with the bundled TWAIN drivers).

product info

Price $350
Company Artec
Phone 510.440.1200
URL www.artecusa.com

MORE BANG FOR THE SCAN BUCK

Oak **WARP** 5

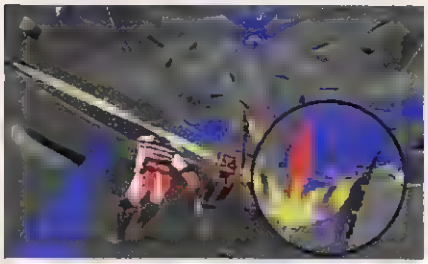
New bully on the 3D block

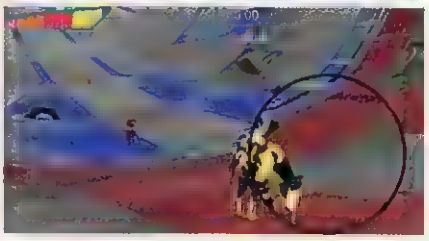
Usually you can see a new chip or technology coming from a mile away; the hype hitting you in the face like spittle from an annoying chatty co-worker. But on rare occasion, a new chip sneaks in under the radar, generating so little buzz ahead of time that when it pops up nearly fully formed right under your nose, it hits you like a brick between the eyes. The Oak WARP 5 is such a brick, and it's aimed squarely at knocking the 3D crown right off 3Dfx's head. From what *boot* has seen in this hands-on preview, 3Dfx better duck fast—the standard for visual quality it set has just been called, and raised.

Notice the smooth diagonals in this Oak demo, thanks to the WARP 5's automatic anti-aliasing. Trilinear filtering helps to smooth the textures disappearing into the distance.

The key to the WARP 5's visual appeal is a nontraditional 3D architecture that renders the screen one tile at a time, similar to the PowerVR. This allows the chip to perform 24-bit Z-buffering and full-scene anti-aliasing with no external memory or overhead.

The memory bandwidth saved by avoiding a Z-buffer allows trilinear filtering to be the default, and a fill rate of 50 million pixels per second even with all features turned on. With anti-aliasing and trilinear filtering engaged by default, there's an instant visual-quality boost to every existing 3D game. Other 3D features of note include nonlinear fogging, object morphing, order-independent translucency, and, of course, perspective correction and Gouraud shading.





***Hyperblade** takes on a new look without the familiar jagged edges seen when playing on the 3Dfx. When the scene is in motion, the difference is more obvious.*

The nontraditional architecture that gives the WARP 5 its amazing feature set and performance is also (as with the PowerVR) its greatest weakness. For

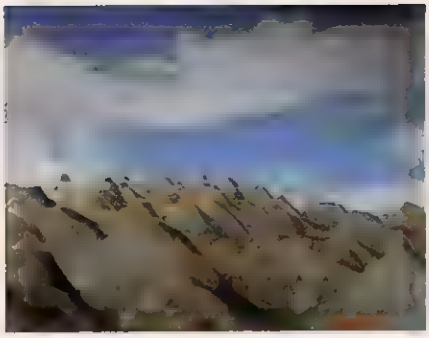
Extreme Tactics

To the coolar!

***David Gregory**, chief creative officer of Media Station and creative director for* Extreme Tactics, *shows you how to crush your enemies, see them driven before you, and hear the lamentation of their women.*

***boot** Describe the plot of* **Extreme Tactics.**
Gregory *Extreme Tactics* got its title because it's the most tactical game we've seen. The combination of the war machines you deploy and the battle tactics you use are the heart of the game. Two opposing clans, the oppressive Bloodfox and the visionary Hammerhawks, wage war—via remote-controlled war machines—over control of coolar crystals, the sole source of energy on the planet's surface.
***boot** What's will make* **Extreme Tactics** *different from the flood of real-time strategy games?*
Gregory *Extreme Tactics* is a significant departure from the crowd because of two significant features: you design your own war machines from a variety of chassis, transports, weapons, and shielding; and each war machine can be independently programmed with its own AI. There's potential for hundreds of different war machines, and programming the AI is simple and intuitive.
***boot** What about graphics? Will we see the tried-and-true overhead view? The traditional sprite-based engine?*
Gregory *Extreme Tactics* brings a high degree of visual realism to the genre. All the art is rendered in 3D. The engine is an overhead three-quarter view, sprite-based engine. Unlike any other real-time strategy game, it has three levels of zoom in the game screen. This is an extremely powerful tool in a strategy game. For instance, the close zoom is so close that the war machines have a lot of detail, such as multiple weapons (up to five) on a single vehicle—close enough that you can take control of individual weapons and independently target multiple enemies.
***boot** How many units will gamers be able to control at once?*
Gregory Theoretically, there's no limit. Groups and formations are available to simplify this, however. *Extreme Tactics'* units pack a lot more firepower than, say,

***Extreme Tactics'** metallic war machines wage a bitter battle over dwindling resources of coolar crystals.*



The complex depth of this scene illustrates WARP 5's 24-bit Z-buffering capability.

example, some 3D software can access a Z-buffer or mix 2D and 3D rendering to the screen. Such operations are difficult, if not impossible for the WARP 5 to do correctly and quickly, resulting in potential software incompatibilities. In this arena Oak is looking toward the PowerVR camp as a friend rather than a competitor—the millions of dollars that NEC is spending to teach developers how to avoid problems on the PowerVR will also benefit software on the WARP 5.

Unlike 3Dfx and PowerVR chips that are for 3D-only, the WARP 5 is a full-on 2D accelerator as well. With an integrated 220MHz RAMDAC and support for up to 8MB of EDO or SGRAM, resolutions up to 1600x1200 are supported. Multiple hardware-scaled video windows are allowed and should provide excellent video quality thanks to an 8-tap filter; but integrated TV-out must wait for the next generation of WARP. Also not supported, but coming on a future chip, is 3D triangle setup, AGP, and MPEG-2 motion compensation.

boot compared a prototype WARP 5 reference board to a 3Dfx-based Monster 3D, and Oak clearly wins the visual-quality battle. The 3Dfx seems to have a very slight frame-rate advantage against the preproduction WARP 5 chip, but in every game we tried, the Oak's anti-aliasing and trilinear filtering features gave it a huge visual advantage.

— Chris Dunphy

product info

Available Q3/97
Price $35 in quantity
Company Oak Technology
Phone 408.737.0888
URL www.oaktech.com

Red Alert, therefore the typical game is played with fewer large units. There are more commands available as well, such as protecting, orbiting, and tracking.

***boot** Are we going to see tactical formations used?*

Gregory *Extreme Tactics* has very effective formations. Units within formations are smart enough to know when to retreat, when to leave formation, and will attempt at all times to stay in formation.

***boot** What will be* **Extreme Tactics'** *coolest war machine?*

Gregory All the war machines are cool—in various combinations they can be awesome. We avoided designing a "coolest" war machine.

***boot** How will multiplayer mayhem be handled?*

Gregory Two-player head-to-head, four-player over local network and Internet. Service is to be decided by the publisher, which is under negotiation.

***boot** How many missions will there be? How big will the battlefields be?*

Gregory There will be a campaign for each clan, each with 11 missions. There are also single-player skirmishes with a choice of 25 terrain maps. The biggest we have done so far is 20 screens wide by 20 screens tall.

***boot** What kind of balance did you attempt with all the different units?*

Gregory Balancing is still being done through play testing. On paper, the sides were balanced mathematically. Now we're balancing them emotionally.

product info

Available Q4/97
Price TBA
Developer Media Station
Publisher TBA
Phone 313.971.1112
URL www.mediastation.com

HARDWARE ON THE HORIZON AND SOFTWARE SOON TO SHIP

Oak WARP 5 ... 70
Extreme Tactics ... 70
Wing Commander Prophesy ... 72
Forsaken ... 74
The Elder Scrolls: Battlespire ... 75

The boot Tracking Sheet

TITLE	DEVELOPER	DATE
AMD K6 PCIset with AGP	AMD	09/97
Age of Empires	Microsoft	10/97
Dark Earth	Kalisto/EA	10/97
F22 Air Dominance Fighter	DID/Ocean Int'l	10/97
Grand Prix Legends	Papyrus	10/97
Myth	Bungie	10/97
Rebellion	LucasArts	10/97
SandWarriors	Interplay	10/97
Screaming Demons	Activision	10/97
Sub Culture	Criterion/Virgin	10/97
Blade Runner	Westwood	11/97
Close Combat: A Bridge too Far	Microsoft	11/97
Kings Quest: Mask of Eternity	Sierra	11/97
Populous: The Third Coming	Bullfrog/EA	11/97
Redline	Accolade	11/97
Sid Meier's Gettysburg	FireAxis/EA	11/97
Test Drive 4	Accolade	11/97
Ultima Online	Origin/EA	11/97
Unreal	Epic MegaGames	11/97
AMD K6 300MHz	AMD	12/97
6x86MX 300MHz	Cyrix	12/97
MediaGX MMX	Cyrix	12/97
AMD 640 PCIset/AGP 100MHz bus	AMD	12/97
SF-1000 DVD-RAM drive	Matsushita	12/97
10th Planet	Bethesda	12/97
Baseball 3D	Microsoft	12/97
Anachronox	Eidos	12/97
CART Precision Racing	Microsoft	12/97
Dalkatana	Eidos	12/97
European Air War	MicroProse	12/97
F-22 Raptor	NovaLogic	12/97
Guardians: Agents of Justice	MicroProse	12/97
Heavy Gear	Activision	12/97
Jack Nicklaus 5	Accolade	12/97
Longbow 2	Jane's	12/97
Lunatik	Pure Entertainment/ Psygnosis	12/97
The Dark Project	Looking Glass Technologies	12/97
Wing Commander: Prophecy	Origin/EA	12/97
MMX 6x86	Cyrix	01/98
Adrenix	Digital Dialect/Pie	01/98
F22 Total Air War	DID/Ocean Int'l	01/98
MechCommander	MicroProse	01/98
Prey	3D Realms	01/98
Quake II	id	01/98
Shi	Activision	01/98
Star Trek: First Contact	MicroProse	01/98
Windows 98/Memphis	Microsoft	01/98
450BX PCIset/AGP	Intel	02/98
Duke Nukem Forever	3D Realms	02/98
MechWarrior II	FASA/MicroProse	02/98
Windows NT 5.0	Microsoft	02/98
Crusader II	Origin	postponed indefinitely
Ultima IX	Origin	postponed indefinitely

**These dates are subject to change*

Wing **Commander:** Prophecy

Destiny turns on the afterburner

With Wing Commander: Prophecy, *all eyes are on Origin's Rod Nakamoto—heir apparent to Chris Robert's* Wing Commander *dynasty. How will the premiere space-combat sim survive without its founding father? You're about to find out, with a little help from producer* ***David Downing****, project director* ***Frank Roan****, lead designer* ***Billy Cain****, story editor/live-action director* ***Adam Foshko****, and* ***Jeff Grills****—creator of the Vision Engine and key technologist.*

boot Is* Wing Commander: Prophecy *a continuation of* WC:IV*?
Downing *Prophecy* is the first of a three-part story arc that represents a new direction for the *Wing Commander* Universe. However, one of our key objectives is to strive in every way to re-energize the product line with all-new elements and features—a fresh perspective.

One way we're doing this is by introducing a new player character, Lt. Lance Casey, the son of a comrade of Blair's from the early *WC* days. He's a fresh graduate of the Academy, still wet behind the ears with a lot to prove.

boot Will the Kilrathi be back or will you deal with a third alien race, as was strongly hinted in the* Wing Commander *novels?
Downing *Prophecy* introduces a new alien threat to Confederate space. The only hint of this race is an ancient prophecy that told of a day when the Kilrathi's world would be "consumed by great darkness"—something that came to pass at the end of *WC:III*. We won't comment on the exact events. Let's just say that blowing up a planet tends to attract attention.

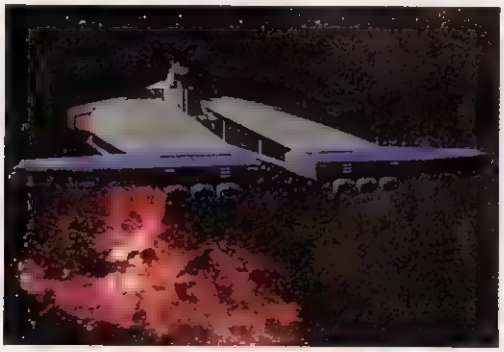
Who these aliens are and what they want make the atrocities of the Kilrathi seem almost childish. These aliens are truly evil in intent and lethal in action.

boot With each* WC *installment the "interactive movie" aspect grew, almost to the point of eclipsing the in-game experience. Do you plan to take* Prophecy *in that direction?
Foshko It's time to shift our focus to one of balance and develop a great story with meaningful dialogue, a true coalescence between design and story—and subtle and believable performances in the live action scenes. The FMV elements in *Prophecy* provide a meaningful context and motivation for the player.

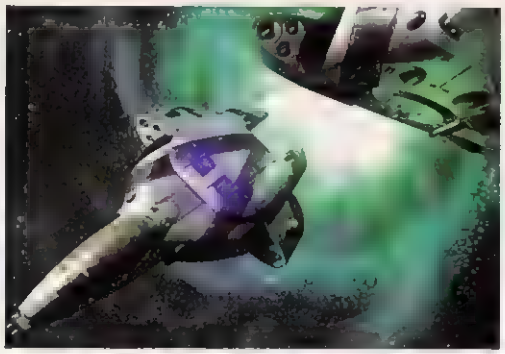
boot How will cinematic cut scenes be handled?
Downing The new paradigm allows interactive decision making in space flight rather than in the movies. So how you fly the missions and how you respond to situations in the cockpit determine the story's plotline. This allows us to more carefully craft the experience from the evolving storyline and more tightly integrate it with the other game elements.

Foshko In previous models, the interactive choice actually broke the suspension of disbelief and the emotional dynamic of the scene, providing only a binary choice.

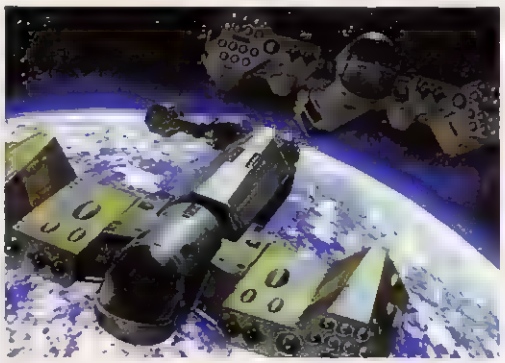
Now, we not only blur the line of interactive/narrative, creating stronger story and character development by not segmenting the scenes, we also introduce more character development into the free-form interactive arena of space flight. We shot something comparable to a feature-film-length script.



Capital ships are back in a major way in Wing Commander: Prophecy. *Beautiful. Simply beautiful.*



Confed fighters make the jump for hyperspace, ready for action.



You can count on ambient, directional, point-source and lens flare lighting effects to fill your space combat experience.

boot Will any Hollywood actors star in the game?
Foshko With *Prophecy* we wanted to bring back some of the characters we really liked and introduce several new characters. So we asked Mark Hamill and Tom Wilson to reprise their roles as Blair and Maniac, in addition to Ginger Allen returning as Rachael. We added Steven, Neil, Loren, Heather, and the rest to this mix and the results were better than we had hoped.

boot As* WC*'s non-space combat world became more lush, the less-interactive it became (example: the non-playable foozball table in* WC:IV*'s lounge). Do you plan to bring interactivity back with* WC: Prophecy*?
Roan We've worked hard to streamline the players' flow between the different elements of the game. One of our goals was to keep the player "two clicks away from the action," no more wandering around looking for someone to talk to in order to fly a mission.

By the same token, we want every room to have meaning; there should always be something to do, no matter where you are. In the rec room you can fly a simulator mission, talk to people, check the kill board, view ships in the object viewer. In the ready room you can check out items in your locker, manage your game settings, etc.

boot Ship-to-ship combat hasn't changed dramatically since the original* WC*—what are you going do to make things exciting again?
Roan *WC* is a fighter-level space combat game. We didn't want to change our focus significantly since there's still so much more to explore at this level. The core of *Prophecy* is based on the capabilities of the

different ships and unique flight dynamics. We created more than 100 missions with only one rule: Be the most fun possible. After several months of straight design, we threw out half our missions and kept only the cream of the crop. Only then did we start working on a compelling storyline and weaving the missions into a new space epic. This attention to detail and focus on gameplay will make the next *WC* awesome.

boot Will there be ground missions again?

Cain While ground missions create a different environment, they're not really part of space-based battle. We do want to create that varied environment for the player so we have huge capital ships allowing us to design missions and environments which are more exciting than ever before.

boot Does* Prophecy *use the original RealSpace engine? Or did you totally overhaul it?

Grills The RealSpace engine has seen its last days as a viable code base. Our new engine, the Vision Engine, has been written from the ground up. We're optimized around the Pentium processor.

We use floating point very heavily instead of fixed point for much greater object motion and rasterization precision. The engine can do BSP-sorted objects, dynamic mesh splitting, dynamic mesh morphing, hardware-accelerated geometry, and rasterization. We can also take advantage of hardware Z-buffering support when it exists. We're trying to take advantage of all the new hardware rasterization features while still providing a good game to those people who have not yet entered the wonderful world of 3D accelerators.

boot What kind of acceleration will the Vision Engine support?

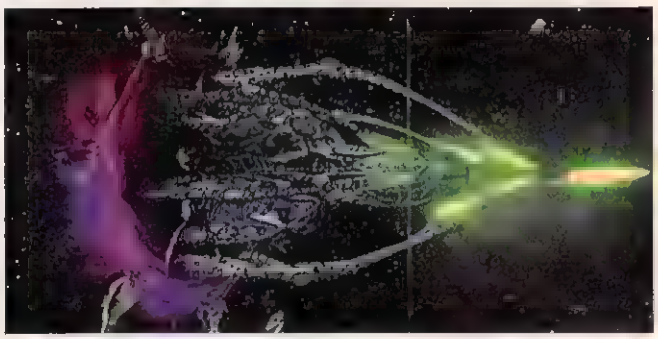
Grills The Vision Engine currently supports our own internal software rasterizer, Direct3D, and the Glide API (3Dfx Voodoo). We have no plans to use MMX or the Pentium II, although we may gain some advantages on those machines from inherent support in DirectX.

Certainly the ultimate gaming experience will be felt on a Pentium 200 machine with 3Dfx-class hardware.

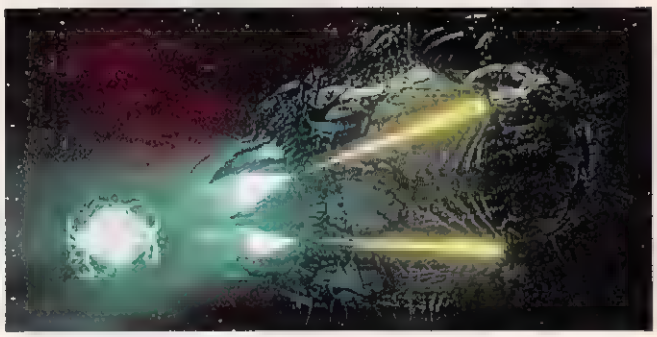
boot The* WC *series has always pushed systems to the limit. With many games coming out as 3D-card-onl. Will* Prophecy *join those ranks?

Roan We want the game to be enjoyable on low-end machines, and at the same time we want to push the limits of high-end machines. So, we're supporting both software and hardware rendering with frame rates ranging from 18 to 24 in most cases, and with detail and effect levels increasing as you move toward the accelerated/high-end systems.

The planet of Kilrah sure ain't what it used to be after you drop a bomb on it. Ouch! Enjoy the destruction.



Syd Mead provides the conceptual artwork for Prophecy*'s alien menace.*



An alien capital ship charges its weapons in Wing Commander: Prophecy.

boot What can we expect in terms of triangle counts for fighters and capitol ships?

Roan Because of the gulf between low-end and high-end machines, this question is difficult to answer.

We change mesh and scene complexity depending on the system. Many of our capital ships have as many as three times the poly count when the game is running on hardware vs. when running in software, so face counts can be deceiving.

boot How will* Prophecy *fair against the likes of* 10th Planet *and* Out of The Void*?

Downing Our new technology and focus on gameplay will crush all others. The care we have used to design the whole game from the space combat up through the mission design and the complete war scenario, skillfully woven with a story that compels the player and draws them into the game without interfering with their senses, will create an immersive gaming experience like no other.

product info

Available *December 97*
Price *TBA*
Developer *Origin Systems*
Publisher *Electronic Arts*
Phone *800.245.4525*
URL *www.origin.ea.com*

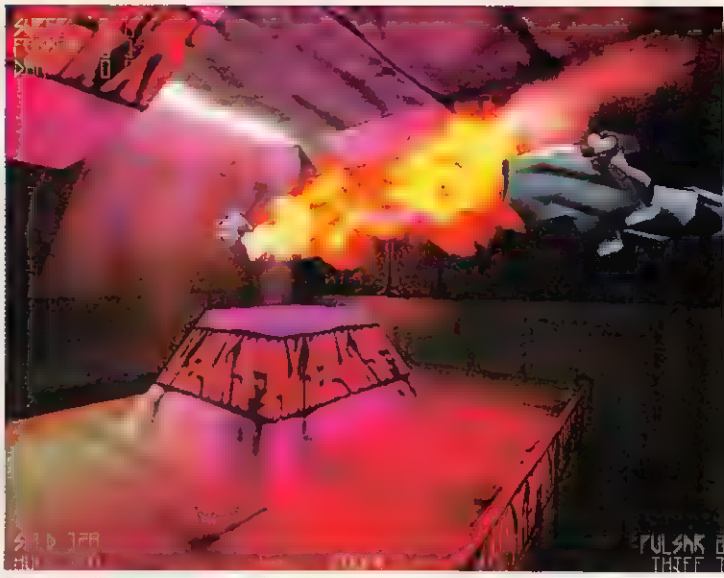
Forsaken

Lootin' for a livin'

Acclaim's Forsaken *threatens to demolish other tunnel-dwelling first-person shooters with some of the most lavish graphics ever to hit your Direct3D card.*

Promising awe-inspiring lighting effects and in-your-face 360-degree movement, Forsaken *will hurl you into a future where Earth's dead and everyone's eager to loot the vast, abandoned stockpiles hidden deep within its deserted mantle.*

Producer ***Shawn Rosen*** *explains why* Forsaken*'s interstellar mercenaries are really just misunderstood merchants out to make a (dis)honest dollar.*



Forsaken *will set a new standard for what is possible with Direct3D. In particular, check out its great lighting effects and the many detail levels you can play with.*

***boot* What's the goal?**
Rosen Torn from its orbital axis, Earth is no more than a lifeless husk. Within days, news of the disaster reaches the High Senators of the ruling council of the multiverse. Soon, anything considered valuable is removed and sites warranting further study are left heavily guarded by robotic military personnel. Now, several months later, the dead system is considered "up for loot." Every bounty hunter, mercenary, fortune seeker, and free-loading scum in the galaxy has the unwritten right to raid the dead system and take anything the Theocracy didn't want.

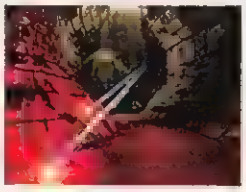
Players assume the role of these ruthless mercenaries.

***boot* What's the object of Forsaken?**
Rosen Amass as many goodies as possible. For variety, there's an objective at the start of each level—some are timed, some are speed-based, some are puzzle-based.

***boot* How big is the game?**
Rosen Fifteen single-player levels, 10 multiplayer levels, and lots of secret hidden stuff!

***boot* How many enemies are in the game?**
Rosen We're still adding these so it's hard to say. Currently, there are about 30, but we're planning more all the time! The most advanced enemy will be another biker who plays just like a human. In fact, in a deathmatch game you wouldn't be able to tell the difference. On the flip side, there will still be a lot of grunts to shoot. We want a really high kill count in the game. Many enemies will come in complex waves, just like the good old 2D shoot 'em-ups!

Lens flare is but one of many luscious special effects in Forsaken.



Assume the role of a ruthless mercenary wielding ominous weapons in Forsaken.

***boot* Are there any sprites or 2D elements lurking in the game?**
Rosen Nope—past shooters had 2D sprites. That's soooo old now. Everything—pickups, doors, enemies—all 3D!

boot* Forsaken *wowed the crowd at E3 with its great special effects. Describe the cool things your 3D engine can do.
Rosen The main thing is lighting. Almost everything can cast a light. Pickups emit light, your weapon fire emits light, even missiles emit light. And everything has its own color-coding. For example, the Quantum mine is a large blue mine that spins and emits a lot of blue light. If you're going around a corner and see the walls lit up blue, back off! Chances are you'll get blown to smithereens.

Also, the game is very scalable. There are lots of detail levels you can play with. Obviously, the more powerful your PC or 3D accelerator card, the more detail you can turn up. If you want more blood, you can have more blood. If you want more lighting effects, you can have more. If you want more detailed bikes, you can.

boot* Will Forsaken *require a 3D card?
Rosen No. We've spent eight months writing a powerful software renderer so people without a card can play the game. While the game won't look as good as it does with a 3D card, it will bear up surprisingly well. The game will run on a P100 upward with any 3D accelerator card, or a P120 upward without an accelerator card. We're getting 25fps on a P120 without a card and all the translucency effects on!

***boot* Is the game going to be Direct3D only, or is it being optimized for any card-specific APIs?**
Rosen It's Direct3D only. We've done more in Direct3D on a 3Dfx card than anyone else has done in GLIDE for the 3Dfx. It's a fast engine. Even Andy Keane (vice president of 3Dfx) said *Forsaken* was the best-looking title on 3Dfx.

***boot* Will the game take advantage of MMX?**
Rosen We had the MMX version working a year ago. We were the first people to start working on MMX thanks to our contacts in the right places.

***boot* How complex are the enemy models?**
Rosen There are 18,000 polygon maps; 200 polys for the average enemy and 800 polys for larger ones.

***boot* What kind of multiplayer options will Forsaken have?**
Rosen There's a bomb-tag game, deathmatch, team play, and capture the flag. All for 16+ players (depending on latency and PC speeds) on network and Internet. Head-to-head modem and serial cable are also supported.

***boot* What about a level editor?**
Rosen We don't plan to release our own level editor, because it's being used for lots of Acclaim games. However, we'll be releasing our file formats so anyone clever can write his own editor. Lots of people get a kick out of creating these and releasing them on the net, and we have no problem with this. I'm sure people will eventually release bike design tools as well!

product info

Available Q1/98
Price TBA
Developer Probe Entertainment
Publisher Acclaim Entertainment
Phone 516.656.2456
URL www.acclaimnation.com

The **Elder** Scrolls: **Battlespire**

A deadly alternate reality

Multiplayer massacres unfurl on an epic scale with Bethesda Softworks' Battlespire. Wield a broadsword or fling a fireball alongside fellow online adventurers and find treasures and danger beyond compare.

Pushing the X^{n}Gine 3D graphics generator with a bevy of new tricks, ***Julian Lefay****, head designer/programmer, and* ***Ken Rolston****, writer/designer (collectively known here as* Bethesda*), take* boot *back into the mythical war-torn Tamriel—only this time with a few of your closest buddies watching (or stabbing) your back.*

boot Will* Battlespire *be a "true" RPG with tons of character interaction or will it be a "3D action game with RPG elements"?
Bethesda *Battlespire* is a true RPG, if dialogue is a measure of character interaction, because you can talk to every creature you meet. Since most of them want to rip your head off, some dialogues are brief and pungent, but you get plenty of chances to bluff, lie, scheme, and betray. There are also plenty of persons who can help you—they're often the ones who appear most likely to destroy you.

All the elements of role playing are here, including character creation and building, NPC interaction, fighting monsters, and quests.

boot How many playable characters will be available?
Bethesda You can play an infinite number of custom variations. The game includes pregenerated characters for a quick start, but the real fun is crafting your own.

The character-creation system is based on the system in *Daggerfall*. Spend build points on stats, skills, weapons, spells, equipment, and colorful advantages and disadvantages. Then, between each level, spend more build points on your character. As you use skills, they increase.
boot What's the AI for NPCs like?
Bethesda We spent a lot of time getting the monsters to the point where you can run but you can't hide. The monsters will smell you, hear you, and use their varying degrees of intelligence to track you. They know their way around the dungeon better than the player and will take advantage of this.

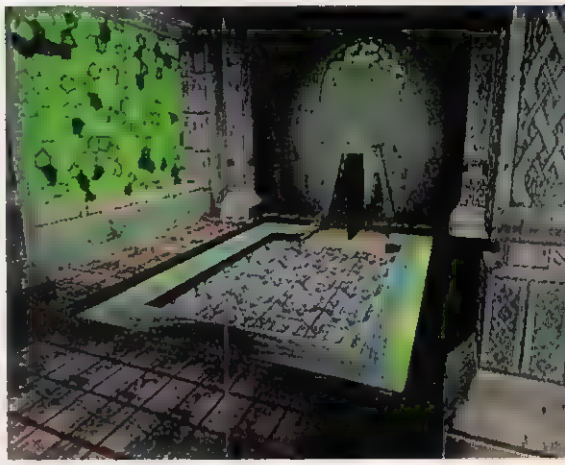
Because of the politics of hell, the monsters often strongly dislike each other and fights between monsters are not uncommon.
boot How will* Battlespire *balance multiplayer options with single-player adventures?
Bethesda The single player's game is the jewel in the designer's crown. The multiplayer game features all the same environments, monsters, and gameplay, but has different goals and challenges.

The greatest elements of *Battlespire*'s multiplayer game are the opposing players who have a vast repertoire of fantasy role playing skills, spells, and tricks.

Beyond the basic deathmatches, where you can bake your buddies, the emphasis is on team play where you and three of your friends take on the Prince of Destruction and his minions. New strategies and teamwork must be used, as each level is tailored for team play.

Most interesting is Team vs. Team. Imagine both teams going into a domain. There's only one way out and you need three keys to open the portal. Your band of warriors heads to the towering castle where the portal lies and fortify it. You know your opponents will lay siege to the castle, whether by boat, balloon, or via the drawbridge.

We've signed an exclusive deal with Mpath, and there will definitely be LAN play.
boot Will all the action take place in a dungeon environment, or will we see some above-ground adventuring as well?
Bethesda Plenty of the action takes place in interiors. How else do you get cool lighting, great architecture, and efficient channeling of the user toward rotating knives? However, an entire level takes place in a grand exterior on a rather large island with a couple of towns, mountains, ships, lots of temples, stone circles, and whatnot. It's really big, really outside, and really cool.
boot How have you geared up the X^{n}Gine for* Battlespire*?
Bethesda The X^{n}Gine has been completely redesigned. All the lighting algorithms have been totally revised for truly dramatic effects. Add high-res and high-color for stunning visuals. The game will run in 640x480 graphics resolution at 64k colors. We currently support 3Dfx Voodoo Graphics and Voodoo Rush using GLIDE. The X^{n}Gine *does* support colored lighting in software but it's still unclear if we'll use it.



Battlespire's dark corridors will yield tons of treasure and loads of trouble.

Polygon count per frame varies between 2,500 to 12,000. Texture-map resolutions vary based on the size of the polygon it's applied to, but most are 128x128.
boot Considering that* Battlespire*'s X^{n}Gine is a full 3D polygon-based engine, why use 2D sprites at all?
Bethesda Everybody's come to expect 3D characters rather than sprites, despite the fact that 3D enemies look chunky, are extremely limited, and still pixelate. The sprites in *Battlespire* are twice the size of *Daggerfall*'s and have twice the frame count. Sprites give us real-looking hair, flowing capes, and all the paraphernalia you expect to see on a person or monster. 3D monsters look like 3D objects that don't convey any mood, the most important aspect of an RPG.

One day, when we can spend a couple of thousand polygons on a figure, have real-time hair, particle systems, and a full-fledged key-frame system, then 3D enemies will be on par with sprites.

Of course, that day is probably extremely close...

product info

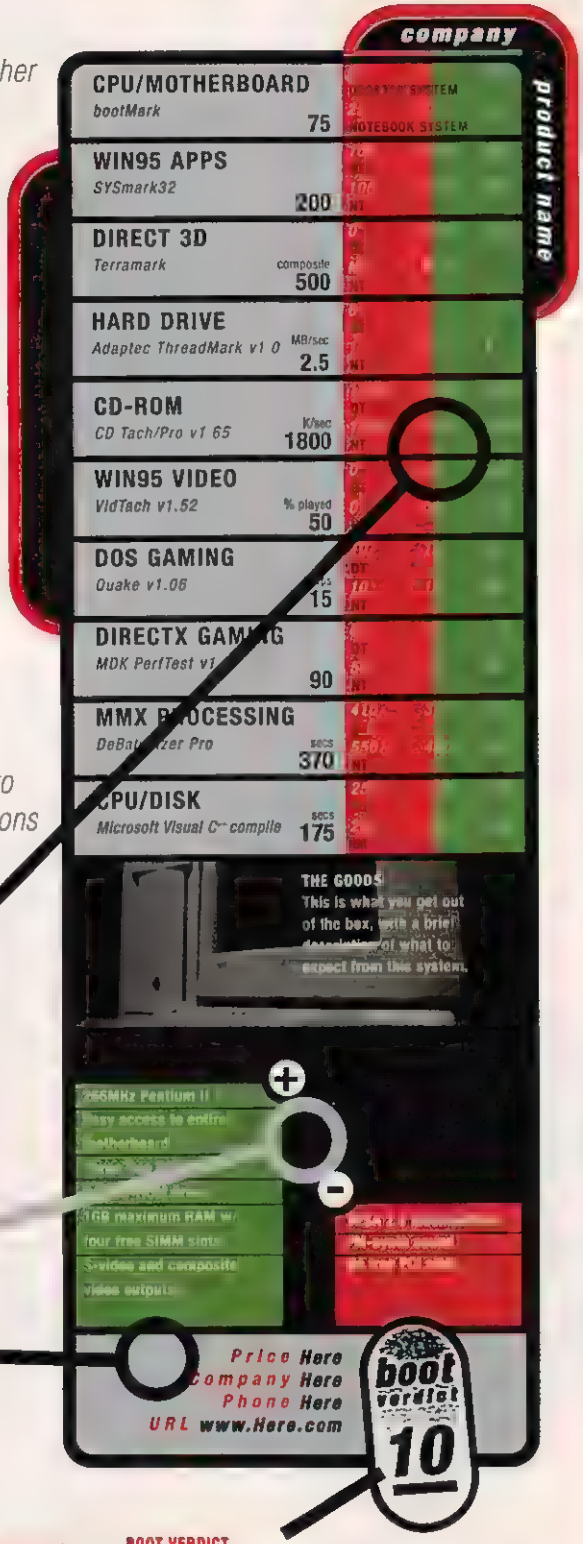
Available *October 97*
Price *TBA*
Developer/Publisher
Bethesda Softworks
Phone *800.677.0700*
URL *www.bethsoft.com*

http://www.thenet-usa.com
Daily Dose
Search Central
Design Resource
Center
Backstage
Blue Pages Site
Reviews
The universe will end in 43 trillion years, so what are you waiting for?

bootLab **Policy**

boot *isn't like any other computer magazine, and neither is our product-**evaluation** process. We don't test equipment in the cold, sterile environment of a warehouse-size lab, and we don't write our reviews based on the **test scores** that labcoat-wearing technicians scribble on clipboards.*

*Our review **scores** are based on a combination of objective **benchmark** testing, real-world performance, and our subjective evaluation of features, performance, and the many less tangible **characteristics** that go into a product. All of our evaluations are based on **hands-on** use of the product.*



REAL-WORLD BENCHMARKING
The new meter has the precise scores for each category benchmarked. Plus, the color bars to the right give you a quick idea of how well the system performed in that category.

It's simple: The farther right the bar reaches, the better the system scored. Green means the system performed on par or beyond what we expect of a current system. If you see nothing but red, the system performed below expectations.

PLUSES AND MINUSES
Here's where we list the best and worst a system has to offer.

CONTACTS
Look here for price, and the company's phone number and URL if you want more information.

BOOT VERDICT
The one that really matters. This score reflects how we feel about a system, taking into account the benchmark results, quality of parts, usability, overall performance, and our intense, under-the-hood scrutiny.

boot KICK ASS! PRODUCT

Only the **best** earn enough respect to be worthy of our **editors'-choice** award.

KICKIN' THE TIRES ON THE LATEST **HARDWARE** AND TAKIN' THE NEWEST **SOFTWARE** OUT FOR A SPIN

HARDWARE

Micron Millenia XRU
Atlec Lansing ACS48 PowerCube Plüs 82
Cambridge Sounds PCWorks 82
GNT Electronics GNT-5000 82
Yamaha System 25 YST-MS25 82
Alienware The Blade 84
Maxi Sound Game Theater 64 86
Tekram P6F40K-A5 86
M-Tech Phantom-R653 88
A.I.R. P6KPI 88
Wacom PenPartner 90
NEC Ready 9725 92
Diamond GyroMouse 94
Xitel Storm
Micro Express Microflex
Optiquest V95 100
Matrox Millennium II 101
Number Nine Revolution Revolution 3D 101
Gateway 2000 Solo 9100XL 102
SGI 02 R5000SC Workstation 104
Diamond Fire GL 1000 108
Toshiba Libretto 50CT 110
Exabyte Eagle Nest

pg 100

SOFTWARE

After Effects 3.1
Wargods
ReBirth RB-338 Techno Micro Composer
HyperWire v1.0 90
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Twinsen's Odyssey 94
Magix Music Studio 96
688(I) Hunter/Killer 100
X-Com Apocalypse 106
Betrayal In Antara 106
Adobe PageMill 107
Formula 1 109
Power F1 109

Micron **Millennia** XRU with Fusion 3D

Explosively fast and dangerous to know

boot KICK ASS! PRODUCT

Slipping open the Millennia XRU's medium tower unveils enough power to humble the mightiest shambler. Intel supplies the system's heart and backbone with a 266MHz Pentium II and a 440FX-laden ATX motherboard.

The CPU enjoys much cooling love in a ménage-à-trois arrangement with the ATX power-supply fan and a case-mounted fan. The motherboard comes armed with four 72-pin SIMM sockets, a dual-layer ATX I/O connector with integrated USB ports, and six expansion slots.

But there are so many goodies in here that the shared slot is the only free one.

Before screaming bloody expansion slot murder, look what you get: a double dose of Diamond, with the 4MB Monster 3D (for that 3Dfx feeling) and the 4MB Stealth 3D 2000 Pro armed with (gasp!) VESA 2.0 support! E4's CoolDVD MPEG-2/AC-3 decoder card (based on Mpact's hardware solution) fills the third PCI slot, with a ribbon cable feeding the Stealth's media connector. Unfortunately, there's no video out for playing DVD movies on the boob tube. The U.S. Robotics Sportster 56.6Kbps fax/modem and Creative Labs' AWE64 round out the ISA package.

The Millennia XRU ditches the CD-ROM and comes with a DVD-ROM drive—Hitachi's second-generation, CD-R-reading GD-2000 DVD-ROM drive. Iomega's Zip drive and a 3.5-inch floppy round out removable storage, and despite the vertical Maxtor 85120 A8 4GB UltraDMA EIDE hard drive, you still have two 5.25-inch and one 3.5-inch drive bays to fill. Extra power cables and necessary EIDE header connectors are all in place for future additions.

Hitachi's 19-inch monitor displays up to 1600x1200, while the kick-ass Cambridge SoundWorks MicroWorks drop hardcore bass with a massive band-pass subwoofer and full-range cubes.

The Millennium XRU ran the gauntlet almost unscathed. The machine pumped a swift 128.7 bootMark, and Win95 application performance under SYSmark32 scored a sweet 237. Hard-drive speeds are well above average, and the optimized Diamond video drivers dropped only 8.9 percent of frames in our video test. Scared of DVD-ROM speed? Fear not, Hitachi's GS-2000 posted data transfer rates of 2079K/sec, making it one of the fastest drives ever!

But where are the DOS drivers? They weren't configured properly, robbing us of full DOS-mode gaming.

Without outside help, *Quake* managed 14.4fps. Firing up *FastVid* unlocked the P-II's power, flowing a 26fps... unaccelerated! But who plays unaccelerated *Quake* when there's a Monster 3D in the PCI slot? *GLQuake* scored a buttery 28.2fps. DirectX and Direct3D benchmark results reinforced the machine's "ultimate" status. In *Terracide* we rarely dipped below 40fps, and the *MDK* PerfTest blasted in at 111.

The Hitachi/E4 combo overlays MPEG-2 movies, effortlessly scaling and playing up to 1024x768. While no motion shearing is evident, non-interlaced displays exasperate edge-pixelation—blockiness is evident on curves. AVI playback is also pixelated.

The Millennia XRU works as well as it plays, scoring extremely well on both our C++ and *DeBabelizer Pro*/MMX tests.

Micron's Millennia XRU with Fusion 3D *is* Pure PC Power.

— Andrew Sanchez

Seeking massive VESA 2.0 speed? Try a combination of S3VBE20 alongside FastVid.

Quake, Comanche 3, *and other VESA 2.0-friendly games will love you for it.*

under the hood

THE BRAINS	
CPU	Intel Pentium 266MHz MMX
L2 Cache	512K internal pipeline burst
RAM	64MB EDO-DRAM DIMM (128MB maximum)
Motherboard	Intel 440FX ATX formfactor
THE BRAWN	
Video	Diamond Stealth 3D 2000 Pro (S3 ViRGE) with 4MB, Diamond Monster 3D (3Dfx Voodoo) with 4MB EDO-DRAM, E4 CoolDVD MPEG-2/AC-3 decoder card
Hard Drive	Maxtor 85120 A8 4GB EIDE UltraDMA/ATA-33
CD-ROM/DVD-ROM	Hitachi GS-2000 DVD-ROM drive
Expansion Bus	Three PCI, two ISA, one PCI/ISA shared
Fax/Modem	U.S. Robotics Sportster 56x2
I/O Ports	Two USB; two serial; one parallel
THE BEAUTY	
Display	Hitachi CM751U; 19-inch screen size, 0.26 dot pitch, 1600x1200 @ 75Hz
Sound	Creative Labs AWE64 wavetable synthesis/digital
Speakers	Cambridge Soundworks MicroWorks
Other	Microsoft Intellimouse, Iomega Zip drive, Microsoft SideWinder Pro joystick

EXPANSION MAP

PCI	Diamond Stealth 3D 2000Pro
PCI	Diamond Stealth 3D video card
PCI	E4 CoolDVD MPEG-2/AC-3 decoder card
PCI	Shared/free
ISA	Sportster 56 Xbow

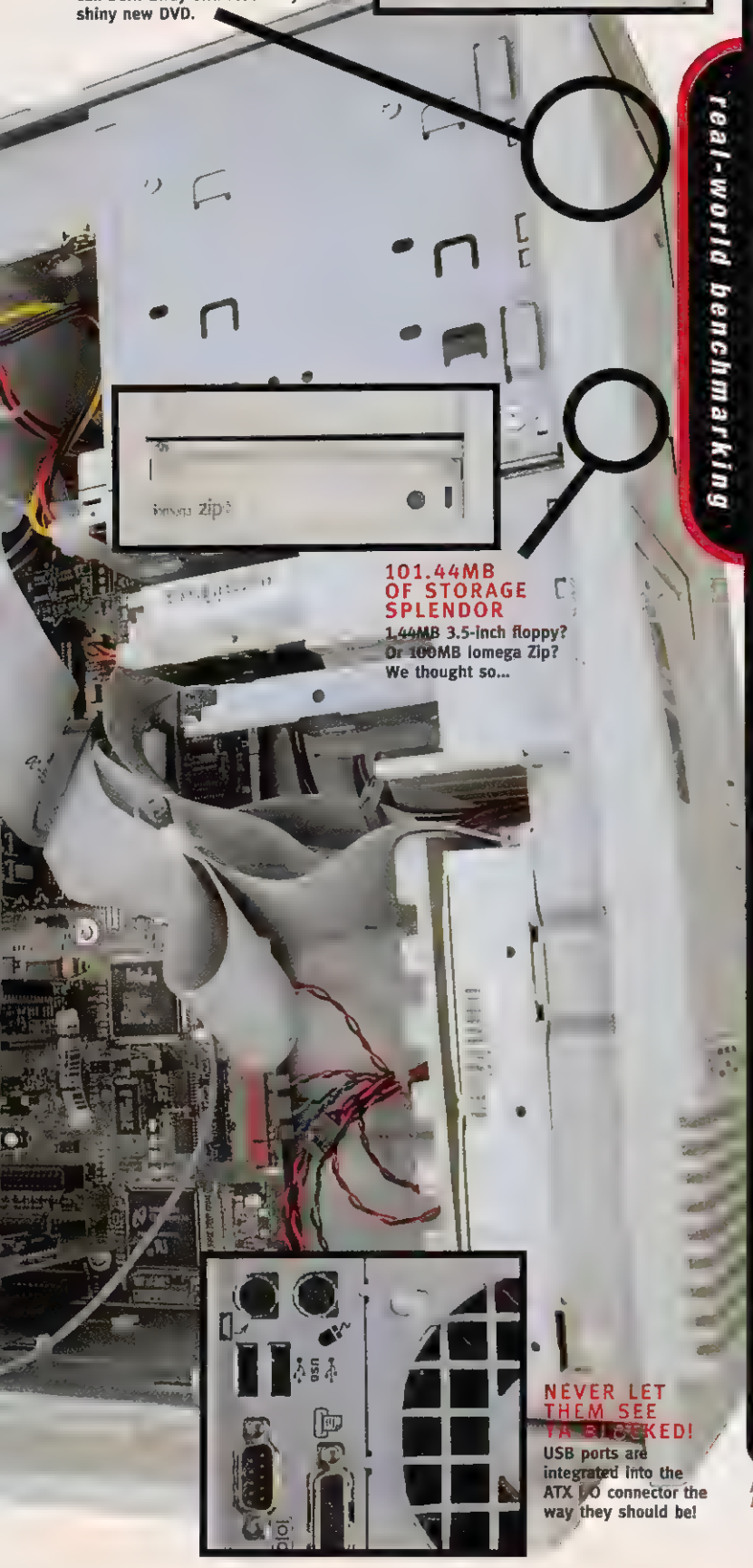
THE BUNDLE Windows 95 OSR/2 and Plus! pack ▮ Blockbuster Guide to Movies and Video ▮ Microsoft Office 97 SBE ▮ Billboard Music Guide ▮ Pod ▮ Eraser Turnabout ▮ Adobe PhotoDeluxe ▮ Silent Steel DVD ▮ Longbow Gold ▮ Formula F1 ▮ Command & Conquer Win95 ▮ MechWarrior 2 Mercenaries (3Dfx) ▮ US Navy Fighters 97

boot :52 down :06

SIMM ENVY
Four SIMM slots do not a gig make. With 32MB SIMMS, you're maxing out at 128MB.

THERE'S GOLD IN THEM THAR DVD DRIVES

Hitachi's second-generation DVD-ROM drive makes good on the CD-R disk readability promise. Now you can burn away and read on your shiny new DVD.



101.44MB OF STORAGE SPLENDOR

1.44MB 3.5-inch floppy? Or 100MB Iomega Zip? We thought so...

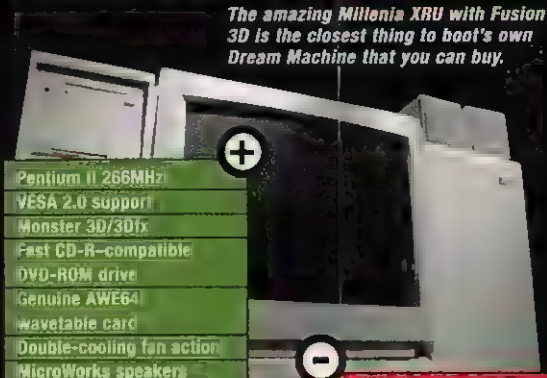
NEVER LET THEM SEE YA BLEEDING!

USB ports are integrated into the ATX I/O connector the way they should be!

real-world benchmarking

	Micron Millenia XRU
CPU/MOTHERBOARD *bootMark*	128.7
WIN95 APPS *SYSmark32*	237
DIRECT 3D *Terramark*	composite 829
HARD DRIVE *Adaptec ThreadMark v1.0*	MB/sec 3.88
CD-ROM *CD Tach/Pro v1.65*	K/sec 2079
WIN95 VIDEO *VidTach v1.52*	% played 91.1
DOS GAMING *Quake v1.06*	fps 14.4
DIRECTX GAMING *MDK PerfTest v1.4*	111
MMX PROCESSING *DeBabelizer Pro*	secs 227
CPU/DISK *Microsoft Visual C++ compile*	secs 112

The amazing Millenia XRU with Fusion 3D is the closest thing to boot's own Dream Machine that you can buy.



- Pentium II 266MHz
- VESA 2.0 support
- Monster 3D/3Dfx
- Fast CD-R–compatible
- DVD-ROM drive
- Genuine AWE64 wavetable card
- Double-cooling fan action
- MicroWorks speakers
- Hitachi 19-inch monitor
- Zip drive
- USB ports on ATX I/O connectors
- Shear-free MPEG-2 playback

- One free expansion slot
- Accelerated MPEG-2 playback
- No composite or S-video output on MPEG-2 card
- No DOS drivers installed

Price $4,439
Company Micron
Phone 800.209.9686
URL www.micronpc.com

boot verdict 10

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

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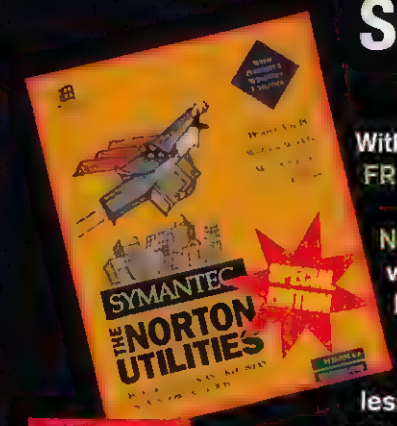

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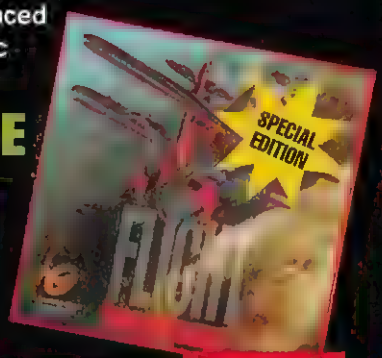

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PURE LUST

PURE ADRENALINE

PURE PC POWER

boot

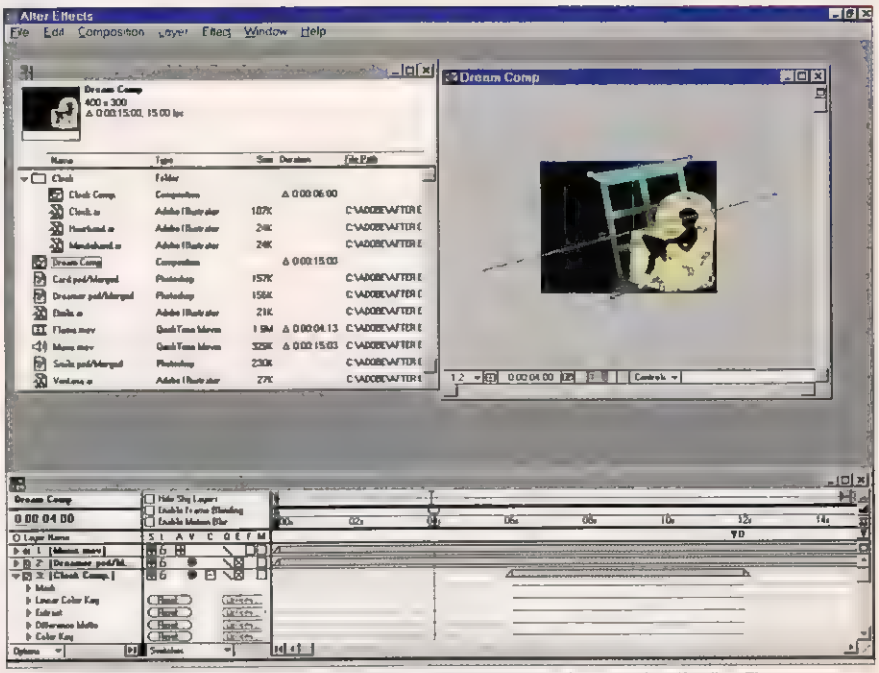
After **Effects** 3.1

Achieve the impossible dream

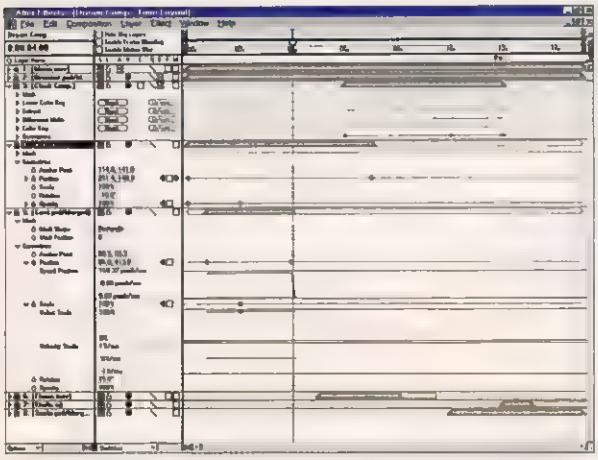
Now that *After Effects* is available for Windows NT, I think we can put Macintosh on the endangered species list.

For those not in the know, *AE* is the quintessential cross-platform 2D special-effects application for the Mac and PC. Eyeon software, makers of *Digital Fusion*, would probably disagree. But where *Digital Fusion* has many high-end features, such as support for SGI and Cineon files, and unlimited output resolution, it lacks the ability to fully integrate with Adobe's *Photoshop* and *Illustrator*. And while there are more powerful applications, such as Discreet Logic's *Flame* and Alias/Wavefront's *Composer*, these applications cost thousands of dollars more and require expensive hardware.

The first thing you do after launching *After Effects* is to import all the media you wish to layer together. These can include a multitude of formats such as TIF, PICT, TGA, PSD, WAV, AIF, MOV, and AVI. If you're using numerous elements within a composition, you can organize your media by name, type, size, duration, or path and assign meaningful names without changing the disk file names. In the timeline, you apply your effects such as motion, mask, position, and opacity to each element. Each effects category has subcategories that—via unlimited key-framing—let you tweak each effect until you get it just right (or you get a splitting headache). Real tweakers can delve into the heart of the program by creating customized effects using *AE*'s programming language, which is based on C. Unlike *Photoshop* or *Premiere*, *After Effects'* learning curve is pretty steep. The best approach to get up to speed is to work from the one-chapter tutorial in the user guide. However, the tutorial doesn't go into depth on some of the more sophisticated effects.



After organizing all your media, you can drag and drop each element onto the convenient timeline. There, you can apply any of After Effects 3.1*'s many effects, such as motion and opacity.*



Elaborate effects can be assembled with After Effects 3.1*'s powerful interface.*

What really makes *After Effects* shine is the tight integration with the rest of the Adobe family. With a click of a button, you can enter *Photoshop* or *Illustrator*, make changes to an element, and have those changes automatically updated within *AE*. When you create text or objects in *Illustrator*, you can set *AE*'s default to continually rasterize so you don't see jagged edges when you scale an object. And when creating multiple layers in *Photoshop*, *AE* can import the image's individual layers. Other features worth mentioning include 99 levels of undo, multiprocessor support, and an MMX-enhanced engine.

While it's hard to find fault with such an awesome application, a few things should be addressed in the future. First, *AE* needs a more visually appealing interface—maybe something with warmer colors and beveled edges. Second, the screen gets crowded easily—you may feel the need to invest in a dual-monitor card from Diamond or Matrox, or wait for dual-monitor support in Windows 98. Third, there needs to be tighter integration with *Premiere*. And fourth, lose the hardware lock. It's bad enough that most other applications have one, but you're in danger of having the back of your machine look like the Lego version of the Empire State building.

— Rick Popko

Price ***Production bundle $1,995; Standard $995***
Developer/Publisher ***Adobe***
Phone ***800.492.3623***
URL ***www.adobe.com***

Multimedia **Speaker Warfare**, Part Deux

Bring in da noise

Looking for a Stealth speaker system or the ultimate low-frequency dive-bomber? Something here's gonna make your new sound card rock.

These latest recruits in the war for multimedia speaker supremacy will have you bombing the bass and bringing some serious funk to your desktop.

— Andrew Sanchez

Cambridge SoundWorks' PCWorks satellites are the sweetest-sounding of the bunch—crystal clear highs and great midrange. Is that an alto sax, or are you just happy to see me?

Altec **Lansing** ACS48 **PowerCube** Plus

boot KICK-ASS! PRODUCT

The ACS48 PowerCube Plus is the ACS45's big, bad-ass brother—and it's ready to drop some sweet sonics on your behind.

This system consists of two satellite speakers housed in sealed, plastic enclosures, taking up the same footprint as its smaller brethren, the ACS45 (check out *boot* 06 for the review). Inside each taller, magnetically shielded satellite is one 3/4-inch Mylar/polypropylene tweeter and a 3-inch paper-cone long-throw midrange handling frequencies above 150Hz. Frequencies are split between them at 4kHz. Rather than incorporating an automatic on/off switch (such as in the ACS45), a press of both volume buttons powers the system up or down. The two buttons are located atop one of the speakers, and a single PS/2 connector snakes from one satellite to the subwoofer box.

The AC48's ported subwoofer enclosure is a 16-pound, 3.2-ounce monster housing a 6-inch paper long-throw woofer. Measuring 14x7 1/2x11 inches, the enclosure is made from particleboard, unlike most other boxes, which use high-impact plastics in the manufacturing process. The 2 3/4-inch vent is located in the rear, alongside the subwoofer volume control, dual 1/8-inch stereo mini inputs, and fuse connector. The amplifier, which pumps 40 watts to the bass and 20 watts per satellite, and the power brick are located internally.

Under our barrage of tests, the ACS48 produced a wall of room-shaking sound that packed a physical punch. Bass response, whether from kick-drum attack or missile explosion, remained incredibly powerful and forceful thanks in large part to the solidly built woofer box throwing out mighty beats. The satellites also screamed serious sonic delight, bringing up and forward excellent midbass and silky-smooth vocals. The addition of the tweeter shores up any high-frequency deficiencies the 3-inch midrange speaker may have, and the entire system's frequency response covers the entire sonic spectrum.

These speakers are the best you can buy for under $150. Period.

With a massive subwoofer box and midrange/tweeter combo, Altec's ACS48 rules!

Price *$149*
Company *Altec Lansing*
Phone *800.648.6663*
URL *www.altecmm.com*

boot verdict 9

Cambridge SoundWorks **PCWorks**

The PCWorks crash the sub-$100 price barrier with a subwoofer/satellite system that signals Cambridge SoundWorks and Creative Labs' first joint multimedia speaker effort.

This package starts with a 5 3/4-inch woofer inside a vented enclosure. The plastic enclosure contains the master power switch, satellite speaker outputs, and subwoofer volume control, as well as dual amplifiers with 10 watts going to the woofer and 3.5 watts per channel for the satellites. The 3x3x3-inch cubic satellites are armed with a single 2-inch speaker, and custom angled brackets are included to disperse sound. Thin-gauge speaker wire runs from the satellites to the woofer box. Unfortunately, the power cable ends in a hefty brick, making placement on a power strip a burden.

The satellites deliver superior upper-band frequency response, with crystal-clear highs and great midrange response. Once again, those magicians at Cambridge managed to push a tight, controlled midbass response front and center, despite the speakers' diminutive size. The subwoofer's vented enclosure pumps clean bass, but response drops dramatically below 60Hz. Corner loading helps immensely, but don't expect to bring down the house with any ultra-low frequency reproduction—the woofer is too small to handle such duties. Still, bass response within the 60Hz to

100Hz bandwidth is pure acoustic heaven.

The PCWorks never stray from target, delivering some of the cleanest sounds you can get for less than 100 bucks. You'll be hard-pressed to find a better set of speakers for twice the price.

Price $99
Company Cambridge Soundworks
Phone 800.367.4434
URL www.hifi.com

GNT Electronics GNT-5000

The GNT-5000 subwoofer/satellite system is a hit-and-miss affair, striking hard in some areas and completely missing the target in others.

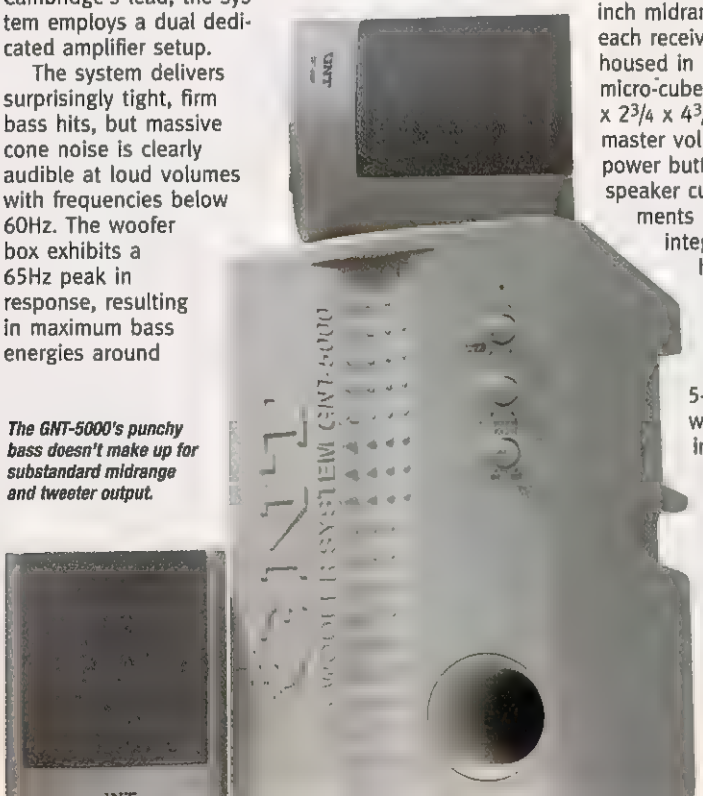
A lone 5¼-inch woofer sits inside a vented enclosure, which is ported in the rear. Knobs galore adorn the woofer box—including the badly placed power switch/master volume control, subwoofer volume control, and treble control. Each satellite consists of a single 3½-inch full-range speaker packed in a sealed cube. Considering the satellites will wind up on your desk somewhere, a master volume control and power switch on a satellite would be preferable.

While the box gloriously claims the system packs 200 watts of "peak power," don't believe the hype. Expect a more down-to-earth 19 watts for the subwoofer and 13 watts for the satellites. Following Cambridge's lead, the system employs a dual dedicated amplifier setup.

The system delivers surprisingly tight, firm bass hits, but massive cone noise is clearly audible at loud volumes with frequencies below 60Hz. The woofer box exhibits a 65Hz peak in response, resulting in maximum bass energies around that frequency. The satellites produce so much treble that we had to turn it down to keep the neighborhood pooches from howling. Despite copious amounts of high frequencies, the midrange section suffers from a midbass frequency-response gap, robbing the hollow soundstage of any realistic sound reproduction. Explosions and other large sonic transients manage to shake the room and also make obvious the subwoofer enclosure's inability to handle them clearly and forcefully. Nothing hurts bass reproduction more than excessive rattling and wind noise.

If GNT works on the woofer noise and midbass problem, it would have a contender on its hands. But too many sonic problems hamper the GNT-5000 from achieving the sonic glory it strives so hard to achieve.

Price $60
Company GNT Electronics
Phone 408.727.3856
URL www.gntelec.com



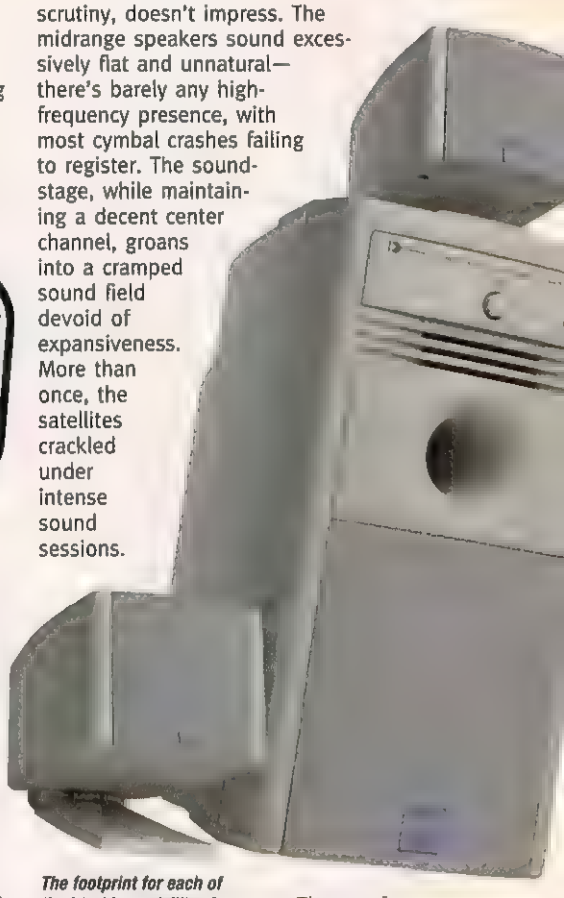
The GNT-5000's punchy bass doesn't make up for substandard midrange and tweeter output.

Yamaha System 25 YST-MS25

Considering its heritage, Yamaha's System 25 YST-MS25 three-piece multimedia speaker system should perform a helluva lot better than it does. Something was lost along the way toward meeting the $129 price point.

The YST-MS25 consists of a subwoofer and a pair of 2-inch midrange speakers—each receiving 5 watts—housed in sealed, plastic micro-cubes measuring 3⅛ x 2¾ x 4¾-inches. The master volume knob and power button on the right speaker cube make adjustments easy, and the integrated brackets help angle the satellites for optimal sound dispersion. The 15 watt-powered 5-inch paper-cone woofer is housed in a ported enclosure, and connections for dual ⅛-inch miniplug inputs and satellites are located on the rear. Like the YST-MSW10 (reviewed in *boot* 10), the MS25 uses Active Servo Technology, with the amplifier monitoring the woofer motion and compensating for over-excursion when necessary. Woofer output volume control and headphone jacks are located on the front face panel above the vent.

The YST-MS25, under intense aural scrutiny, doesn't impress. The midrange speakers sound excessively flat and unnatural—there's barely any high-frequency presence, with most cymbal crashes failing to register. The soundstage, while maintaining a decent center channel, groans into a cramped sound field devoid of expansiveness. More than once, the satellites crackled under intense sound sessions.



The footprint for each of the itty-bitty satellites is great—too bad the sound quality falls short.

The woofer maintains maximum bass energy around the 80Hz to 90Hz range, with the low-end response starting its downward spiral at around 70Hz. Unfortunately, the woofer suffers severe unloading of low frequencies below 46Hz, resulting in wild extemporaneous noise. With corner loading in effect, the woofers fill the room with an 80Hz+ boomin' presence, but don't expect to shake the china off the shelves. On the whole, the system suffers from a frequency dip in the midbass section, resulting in a hollow sound.

Price $129
Company Yamaha
Phone 800.823.6414 x99
URL www.yamaha.com

Alienware's The Blade

Abduct this computer

When the Alienware boxes arrived at the bootLab—replete with military stamped lettering—anticipation ran high that the boxes would contain an alien artifact (we were hoping for a face-hugger). Unfortunately, about the closest we came to a real alien, was the tiny, neon-green one stuck to the front of the case. Still, our autopsy proved The Blade to be an exciting specimen.

In addition to the core 200MHz MMX Intel processor, The Blade's life force is augmented by robust memory, video, and audio subsystems. The 64MB of EDO DRAM, and 512K of onboard cache provide ample kick, resulting in above-average performance throughout our suite of benchmarks. However, while the inclusion of a 6MB Stingray 128/3D (4MB frame buffer and 2MB of textured memory) is appreciated (what self-respecting gamer wouldn't want the power of Voodoo Rush?) the complete lack of VESA 2.0 support certainly isn't. Regardless, *GLQuake* works just fine, proffering 20.4fps. (Once Hercules and 3Dfx tweak the Voodoo Rush drivers, you should see this number climb to the high twenties.)

We did, however, run into problems testing full-screen AVI video. During our brutal VidTach test, The Blade played back less than 20 percent of the test clip. MPEG playback was just as bad, with noticeable pixelation and ghosting.

We also encountered a bizarre problem when changing color depths. At 1024x768 @ 32-bit, the display looked terrific. However, dropping to 16-bit resulted in screen noise and static.

Overall, the Stingray 128/3D is a mixed blessing: it offers the latest in 3D acceleration, but with immature and unperfected drivers.

The AWE64 is a great choice (especially if you're planning to play your Sound Blaster-compatible favorites), and the EMU8000 wavetable-synth engine sounds great. If you're musically inclined, the AWE64 also includes a software wavetable engine, WaveSynth, based on Sondius' WaveGuide technology, but it doesn't sound as good as the hardware version.

System expansion is a snap, thanks in part to the Tyan Turbo TX ATX motherboard. Memory can be buffed up to 256MB, and access to the bays and slots is unobstructed (you'll be itching to fill the four free PCI slots). Just about the only thing missing is USB ports.

Alienware has made some excellent component choices. The 17-inch ViewSonic OptiQuest monitor provides a bright, crisp display and the U.S. Robotics Sportster 33.6Kbps fax/voice/modem comes with an impressive array of communication software.

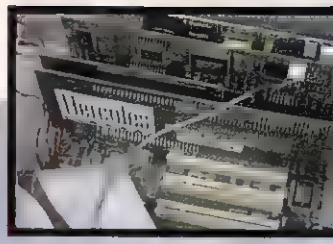
The 3.2GB Quantum Fireball ST hard drive transferred 3.06MB/sec, and the 16x Hitachi CD-ROM drive pumped an equally impressive 1815K/sec.

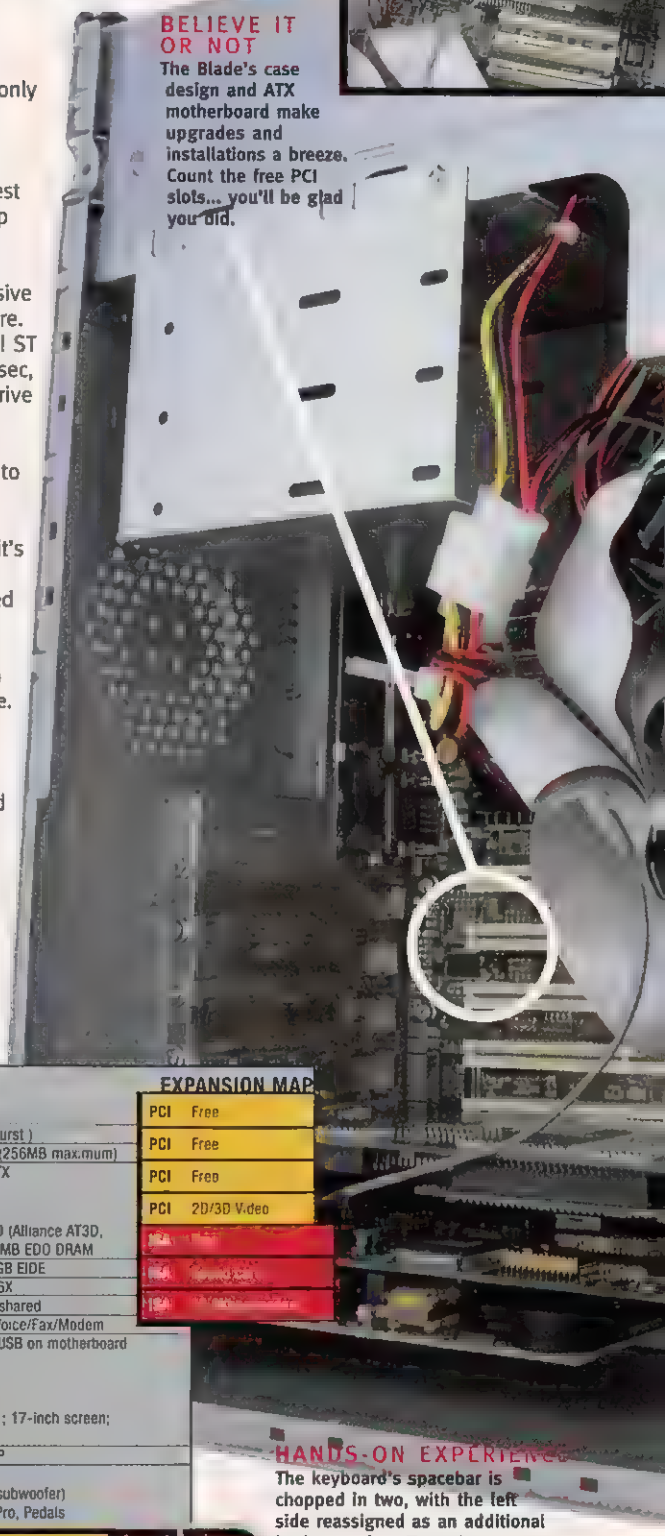
In fact, The Blade managed to outperform similarly equipped systems from Micron and XI Computer. The exception (and it's a big one) is in *GLQuake*—the Micron Millennia MME (equipped with Diamond's Monster 3D) is almost 9fps faster. Regular *Quake* would not run thanks to the lack of VESA 2.0 compliance.

On the negative side, the game bundle is practically non-existent, and the pseudo-ergonomic keyboard—equipped with a half-spacebar that's really a backspace key and an oversized row of keys on the bottom—will drive keyboard fraggers (and touch-typists) bonkers.

Still, first contact is highly recommended.

— Bryan Del Rizzo





BELIEVE IT OR NOT
The Blade's case design and ATX motherboard make upgrades and installations a breeze. Count the free PCI slots... you'll be glad you did.

under the hood

THE BRAINS	
CPU	Intel Pentium 200 MMX
L2 Cache	512K (external pipeline burst)
RAM	64MB EDO-DRAM DIMM (256MB max.mum)
Motherboard	Tyan S1572 Titan Turbo TX
THE BRAWN	
Video Card	Hercules Stingray 128/3D (Alliance AT3D, 3Dfx Voodoo Rush with 6MB EDO DRAM
Hard Drive	Quantum Fireball ST 3.2GB EIDE
CD-ROM	Hitachi CDR-8130 CAV 16X
Expansion Bus	Five PCI, three ISA, zero shared
Fax/Modem	U.S. Robotics 33.6Kbps Voice/Fax/Modem
I/O Ports	Two serial; one parallel. USB on motherboard
THE BEAUTY	
Display	ViewSonic OptiQuest Q71; 17-inch screen; 1280x1024@87Hz
Sound	Creative Labs AWE64 PnP
Speakers	Panasonic EAB MPC250 (two 5W satellites, 10W subwoofer)
Other	CH Products FlightStick Pro, Pedals

EXPANSION MAP

PCI	Free
PCI	Free
PCI	Free
PCI	2D/3D Video

THE BUNDLE Pandemonium I Formula 1 I Compton's Interactive Encyclopedia

boot :49 **down** :03

HANDS-ON EXPERIENCE
The keyboard's spacebar is chopped in two, with the left side reassigned as an additional backspace key. To make matters worse, there's no way to turn it off! The cursor controls' position is awkward, too, even with a second complete set on the left side.

TAKING CONTROL
For gamers, Alienware has tossed in two controllers: CH Products' FlightStick Pro and Pedals (but not the Pro Pedals).

LISTEN FOR SIGNS OF LIFE
The Panasonic multimedia speakers do an adequate job of pumping audio, but can't compete with even the low-end models from Cambridge SoundWorks or Advent.

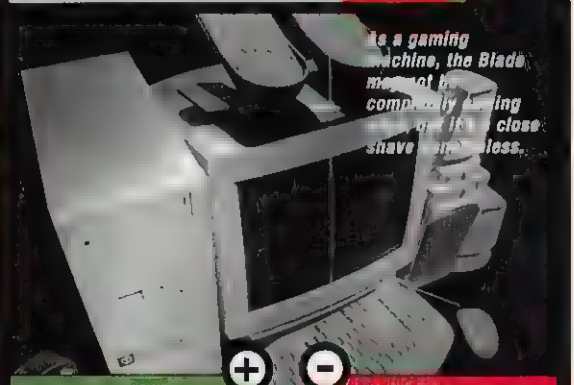
ALIENWARE
PC Systems

...ANU
If you want ... Geiger-inspired ... it. About the only ... worldly thing about ... Blade is this little ... peeking out from the ... front of the case.

Alienware
The Blade

real-world benchmarking

CPU/MOTHERBOARD	*bootMark*	55.4
WIN95 APPS	*SYSmark32*	164
DIRECT 3D	composite	853
HARD DRIVE	*Adaptec ThreadMark v1.0* MB/sec	3.06
CD-ROM	*CD Tach/Pro v1.65* K/sec	1815
WIN95 VIDEO	*VidTach v1.52* % played	19.1
DOS GAMING	*Quake v1.06* fps	would not run
DIRECTX GAMING	*MDK PerfTest v1.4*	92
MMX PROCESSING	*DeBabelizer Pro* secs	363
CPU/DISK	*Microsoft Visual C++ compile* secs	165



...s a gaming ...chine, the Blade ... not ... comp... ...ing ... close ... shave ... less.

+
- Intel's 200 MMX CPU
- 64MB EDO DRAM
- AWE64 wavetable sound
- 6MB 3Dfx-Voodoo Rush-powered Stingray
- Free PCI slots abound
- Good case design

−
- No VESA 2.0 support
- Video drivers need ... to be polished
- Funky keyboard
- Lackluster game ... bundle
- No USB port...

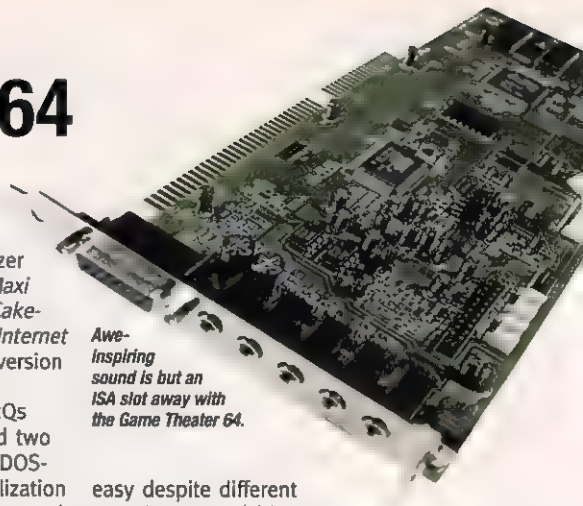
Price $2,899
Company Alienware
Phone 800.494.3382
URL www.alienware.pc.com

boot verdict **8**

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

Maxi Sound **Game Theater 64**

Takin' MIDI to the max



Awe-inspiring sound is but an ISA slot away with the Game Theater 64.

Blow full 64-voice hardware wavetable synthesis in your hot, sweaty ear with Maxi Sound Game Theater 64. Designed by Guillemot International as a supreme gaming sound card, inside its ISA-based confines sits almost every trick of the trade.

The Game Theater 64 is an SPDIF-less version of the Home Studio Pro 64 (reviewed in *boot* 12) with 4MB of wavetable RAM. Dream's 50-MIPS RISC DSP serves up all your sonic needs, from Sound Blaster hardware support and full-duplex capabilities to 128 instruments, nine drumsets, and one onboard SFX patch for full MPU-401 General MIDI and GS compliance.

A solo socket makes the total sample RAM upgradable via 72-pin SIMM to 20MB, while the board also includes a Wave Blaster–compatible header connector.

The 1/8-inch inputs for microphone and line-level sit alongside three outputs—stereo amplified output, line-level front speaker output, and surround sound/rear output—for a multichannel, multispeaker surround-sound scenario. A standard game port is also included on the back panel. The Game Theater 64 is DirectX 5.0 compatible, so those DirectSound 3D games will immerse you in multispeaker madness—but the card isn't Dolby Surround Sound compatible, so games such as *Wing Commander IV* and *Comanche 3* can't take advantage of the card's capabilities.

The buttload of software includes *Maxi FX*, a 4-band paragraphic equalizer with reverb effects and delays, and *Maxi Bank Downloader* (for sound fonts). *Cakewalk Express*, *Midisoft Audio Works*, *Internet Phone*, and a Maxi Sound-optimized version of *Pod* round out the bundle.

The Game Theater 64 uses two IRQs (05 for digital and 09 for GMIDI), and two DMAs (01 and 03 on a system). Full DOS-mode support is handled by an initialization program that configures during bootup and doesn't take up any memory. The only problem we encountered was that the card initially set itself up with an IRQ of 10, which is fine for most games but prevents some from working properly because their digital sound engine requires IRQs lower than 10. A simple edit to the Game Theater 64's .INI file fixes that.

The MIDI patches are better than most, with authentic-sounding upright bass and articulated piano patches, although the violins and choir patch sound synthesized. Some patches sound better than others—the wind chimes play a solid tone rather than individual chimes when pumping *Ultima VIII*'s MIDI files, and the electronic bass guitar lacks authority compared to Roland's SCC-1 patch library.

DirectX 3a games such as *Dungeon Keeper*, *Diablo*, and *X-Wing vs. TIE Fighter* play fine, while DOS games prove just as easy despite different sound engines (although the Game Theater 64 almost always auto-detects as a Sound Blaster Pro rather than an SB16/AWE32). BUILD-based games, which configure for AWE32 digital effects, are the exception. General MIDI under DOS works just a seamlessly.

According to Intel's Media Benchmark, the Game Theater 64's 9.46 percent CPU utilization compares favorably to Ensoniq's AudioPCI card's 8.41 percent. As a competitive Sound Blaster AWE64 alternative, the Game Theater 64 is a great place to start.

— Andrew Sanchez

Price $199
Company Ubi Soft
Phone 800.824.7638
URL www.ubisoft.com

boot verdict 8

Wargods

The gods must be crazy

Ten forgettable fighters come together in *Wargods* to beat the crap out of each other in a test of immortal combat set in a fighting ring. Bloody, multihit combos, projectile weaponry, and fatalities are all part of the action, only this time, punch and kick your way to victory in a 3D environment.

Using Midway's DigitalSkin technique, scans of real people make up the texture maps for each polygon humanoid fighter. The results: an obtuse amalgamation of vaguely human, yet boxy, characters that move with the grace and manner of a Rock 'em Sock 'em Robot. Each arena is a sad mixture of texture-mapped polygons suffering from severe texture seams and pixelated 2D sprites. Projectiles and special magic attacks also suffer the sprite treatment. Direct3D is in full effect, filtering those nasty textures and boosting frame rates into a semi-smooth state. But the polygons are so badly animated that you'll wonder where the motion capture is. Something's wrong when a 3Dfx card fails to stimulate.

Enjoy **Wargods'** *goddess-on-goddess violence.*

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
DirectX
Direct3D DirectSound DirectInput

Wargods is almost devoid of gameplay technique, with combat reduced to cheap projectile-spewing, funky chain-combos straight from *Mortal Kombat 3*, and way too much reliance on throws. Uppercuts are rip-off from *MK*, and the carnage-induced fatalities, while interesting to view the first time around, become as boring as watching blood dry. The ability to move within 3D space is diminished when opponents throw containment attacks at you and follow up with brutal teleportation attacks.

As a fighting game, *Wargods* doesn't have the cajones to step up against *Tekken* or *Virtua Fighter*.

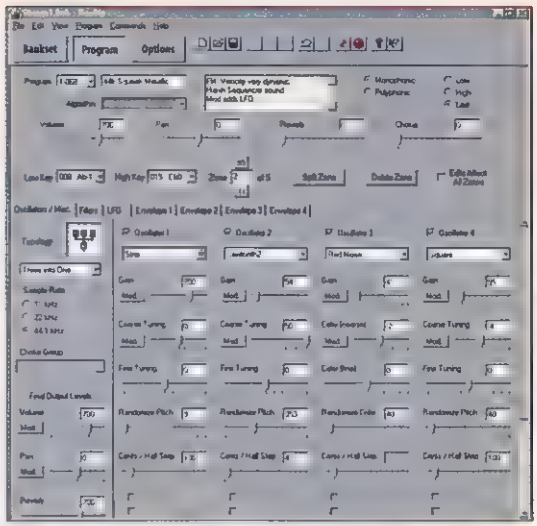
— Andrew Sanchez

Price $30
Developer Eurocom Entertainment
Publisher GT Interactive
Phone 800.469.5961
URL www.ginteractive.com

boot verdict 1

Reality

Virtual "reality" ain't dead



With so many parameters to tweak, we're glad Seer Systems opted not to emulate a little 24x2 line backlit LCD.

If *Reality* is any indication of the shape of things to come, the electronic music community is in for a huge treat during the next few years. This is a 16-part multitimbral, 64-voice poly/monophonic software-based 20-algorithm FM/PCM/modal/analog/physical modeling synthesizer with reverb and chorus. If creating patches is your passion, *Reality* will feel like playing with a new synth and thinking, "Hmmm, I could do this song with this patch, and..."

Straight to the point: 1,336 (future versions will have a staggering 16,384) programs per bankset (28 are included), 128 split zones per program, four LFOs, four filters, four oscillators, and four envelopes with four time and four levels each—that's a lot of fours! *Reality* supports unlimited RAM and sums down all processing to 20-bit output from 80-bit internal processing. *Reality* shows up as any other MIDI port in your favorite sequencer—the way God intended it to be. You can adjust all patch parameters in real time via mapping to any MIDI controller. All standard MIDI event controllers are supported (with no zippering) and, as expected, multiple copies cannot run simultaneously. You can capture any audio the program generates direct to disk as 16-bit/44kHz WAV files or sent out on AWE64G's S/PDIF port (unfortunately *Reality* only works with a Creative Labs 16-bit sound card). Alas, there's no way to easily audition a WAV file prior to importing. Still, it's possible to engineer some extremely fat and complex sounds, and there's way more control here than in many stand-alone synths.

Our biggest gripe with *Reality* is the dongle. IRQs are a scarce resource and musicians require as many as they can get for multiple sound cards—frequently achieved by disabling the printer port. Hence the dilemma. The price seems steep as well, but seeing that a new synth module can easily cost twice the price and is not as upgradable or convenient to use, this is a wise buy.

— Daevid Vincent

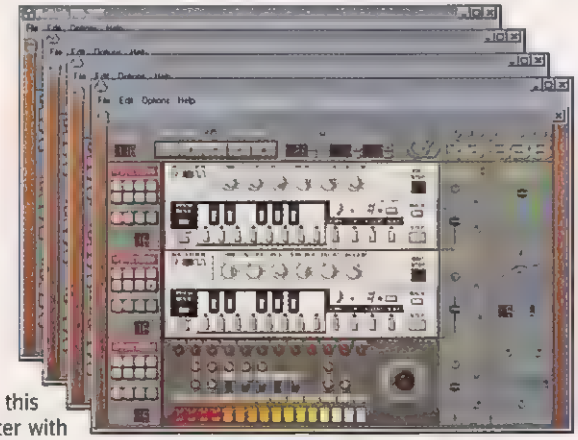
Price $495
Developer/Publisher
Seer Systems
Phone 888.232.7337
URL www.seersystems.com

ReBirth RB-338 Techno Micro Composer

Is it a sequencer with synth or a synth with a sequencer?

Roland's classic TB-303 Bass-Line is in demand these days for techno/trance/industrial music. Everyone craves the analog sound seemingly unattainable by modern synthesizers... until now.

Propellerhead Software's *ReBirth RB-338* is two-and-a-half times what the original synth was and more (literally). The package is two complete TB-303s and a TR-808 rhythm module emulated to the tiniest detail, plus rudimentary delay and distortion boxes. All this can run on a stock P75 or better with *any* sound card. RB-338 supports DirectX, but it's not required. We were able to get four copies (8x303s and 4x808s) of the program playing separate songs on a P200. Yes, it sounded like crap, but the potential's there.



We successfully ran four copies of **ReBirth**. **Granted, it sounded really bad, but the potential is there.**

The *RB-338* is simple to program once you understand that it's really a sequencer with a synthesizer. The *RB-338* has 32 (step-time only) patterns per module that string together to form a song. The Song mode is where all the real-time knob/slider movements are recorded. Unfortunately there's no "rehearsal" mode. Knobs can only be moved in real-time during record, not during playback. Any portion of a song can be saved digitally in 16-bit 44kHz AIF or WAV format.

There's a snag. The hybrid CD-ROM is required to start the program. All copy protection is annoying, but this is one step below a dongle. Also, there's no way to edit your knob/slider movements directly (such as an event list). The audio device is locked and can't be freed to test your grooves in another program or to bring them into a WAV editor without quitting *ReBirth*. In addition to editing utilities (cut, copy, paste, shift, transpose, etc.) there are some wonderful randomize pattern and pitch functions. In case you were wondering, no, you can't just "play" it like a synth module. You can't even enter notes via keyboard. These may not be flaws. The real TB-303 couldn't do these things either, and in every way, this program outshines its grandfatherly predecessor.

—Daevid Vincent

Price $199
Developer/Publisher
Propellerhead Software
Phone 818.993.4161
URL www.steinberg.net

Pentium II Motherboard Makeout

Nothing says lovin' like some home cookin'

So, you're making the move from ZIF to SEC. But which motherboard should you sleep with? Never you fear, boot *kisses all the latest mommies and tells all.*

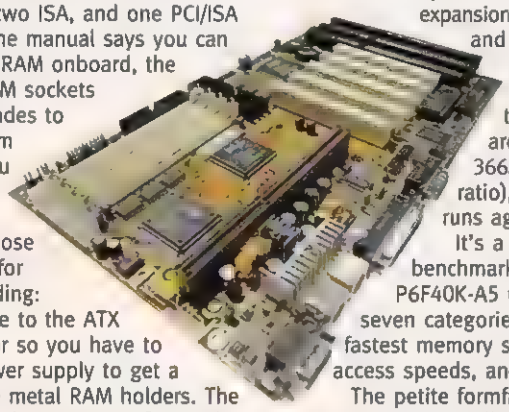
Until Intel ships its AGP-ready 440LX PCIset, your only choice for Pentium Pro-based systems is the tried-and-true 440FX. Still, here are three brand new Pentium-II-ready motherboards, all set to woo you with that seductive MMX magic.

— Andrew Sanchez

Tekram **P6F40K-A5**

Cramped for space? The Tekram P6F40K-A5's baby-ATX formfactor should fit all your P-II needs.

Seven usable expansion slots are available: four PCI, two ISA, and one PCI/ISA shared. While the manual says you can snap 512MB of RAM onboard, the four 72-pin SIMM sockets limit RAM upgrades to 128MB of system RAM (unless you can find 64MB SIMM chips). Placement of those sockets makes for cramped upgrading: they're too close to the ATX power connector so you have to remove the power supply to get a firm grip on the metal RAM holders. The Slot 1 positions the processor for maximum cooling under an ATX power supply and the drive header connectors lie perilously close to the topmost PCI slot, barely nudging any full-length PCI cards.



Unfortunately, onboard USB header connectors mean you'll have to sacrifice a free expansion slot if you want USB, and the CPU-fan connector is located a bit farther than is practical. Jumper settings are configurable, up to 366MHz (x5.5 CPU clock ratio), and the bus clock runs aground at 66MHz.

It's a close race in the benchmarks category, with the P6F40K-A5 winning four of the seven categories, posting the fastest memory speed scores, DMA access speeds, and *Quake* fps.

The petite formfactor haunts the P6F40K-A5, especially with the SIMM socket placement and the lack of integrated USB ports on the ATX I/O connector. But, with five PCI slots and some really good performance, this motherboard is worth a try.

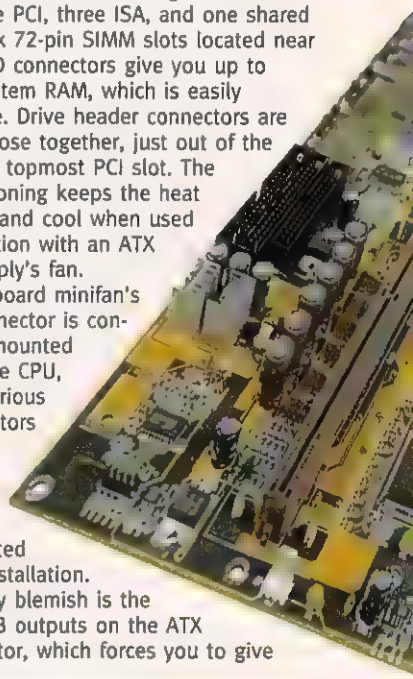
BIOS:	*AWARD 03/19/97*
RAM SUPPORTED:	*Fage Page mode, EDO-DRAM, BEDO-DRAM (72-pin SIMM)*
P-PRO CPU CARD?	*Yes*

Price *$230*
Company *Tekram Technologies*
Phone *510.353.6099*
URL *www.tekram.com*

boot verdict **7**

M-Tech **Phantom**-R653

M-Tech's Phantom-R653 is an ATX formfactor motherboard harboring seven usable slots: three PCI, three ISA, and one shared PCI/ISA. Six 72-pin SIMM slots located near the ATX I/O connectors give you up to 384MB system RAM, which is easily upgradable. Drive header connectors are grouped close together, just out of the way of the topmost PCI slot. The CPU positioning keeps the heat sinks nice and cool when used in conjunction with an ATX power supply's fan.



The onboard minifan's power connector is conveniently mounted close to the CPU, and the various pin connectors for power, hard drive LED, and others are separated for easy installation.

The only blemish is the lack of USB outputs on the ATX I/O connector, which forces you to give

BIOS:	*AWARD 03/04/97*
RAM SUPPORTED:	*Fage Page mode, EDO-DRAM, BEDO-DRAM (72-pin SIMM)*
P-PRO CPU CARD?	*No*

With sexy jumper settings sitting oh-so seductively on these motherboards, is it worth the effort to push your CPU? We've listed benchmark results taken at 233MHz and at an overclocked 266MHz, so you can judge for yourself whether you wanna push your P-II.

The scores are extremely tight, but the Advanced Integration Research and Tekram managed to hog the majority of high scores.

Benchmarks were obtained using the following hardware configurations.

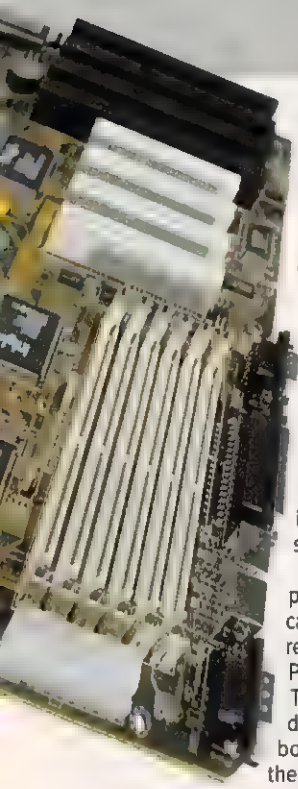
CPU *Intel Pentium II 233MHz*
RAM *80MB EDO-DRAM*
O/S *Windows 95 OSR/2*
CD-ROM *Mitsumi FX120T 12x EIDE*
Hard Drive *Quantum 1280A 1.2GB EIDE*
Mouse *Microsoft*
Video card *Rendition Reference board (Verite V1000E) with 4MB of EDO-DRAM, Diamond Monster 3D (3Dfx Voodoo) with 4MB of EDO-DRAM*

Motherboard	bootMark 233MHz/266Mhz
Tekram P6F40K-A5	109.4/126
A.I.R. P6KPI	**113.3/128**
M-Tech R653	110.9/127.1

Bold *indicates best performance.*

Like its predecessor, the Pentium II suffers from the same write-posting problems as the Pentium Pro. Thankfully, John Hinkley's FastVid *works just as well on a P-II, enabling the write-post feature usually disabled with P-Pro systems, as well as enabling banked VGA write combining and linear frame-buffer write combining. Combine this with a VESA 2.0-compliant driver (either hardwired into a video card BIOS or SciTech's* Display Doctor*), and you'll gain up to 10fps in* Quake*, as well as faster performance under DOS and Win95 applications.*

To get your own copy of FastVid*, take a stroll to* ***web.inter.nl.net/hcc/FastVid/*** *for more info and the latest version.*



up a precious expansion slot. Also, jumper settings limit you to a 300MHz CPU type (x4.5 CPU clock ratio), and the bus clock limits at 66MHz.

Under our intense benchmarks the Phantom-R653 only claimed first in one category: the *MDK* PerfTest. It held its own against the other motherboards in *GLQuake*, although scores were tight.

Considering it only proved worthy in one category, it's hard to recommend the Phantom-R653. There are more delectable boards out there.

Price *$195*
Company *M-Technologies*
Phone *408.441.8818*
URL *www.mtiusa.com*

A.I.R. P6KPI

BIOS:	*AMI 07/15/95*
RAM SUPPORTED:	*EDO-DRAM, Fast Page mode, ECC (72-pin SIMM & 168-pin buffered DIMM)*
P-PRO CPU CARD?	*No*

Smaller brother of our Dream Machine 97's Kick-Ass dual P-II bruiser, Advanced Integration Research's P6KPI ATX formfactor motherboard may not be double trouble, but it packs just as hard a punch. This motherboard has just about everything you'll need for Pure PC Power.

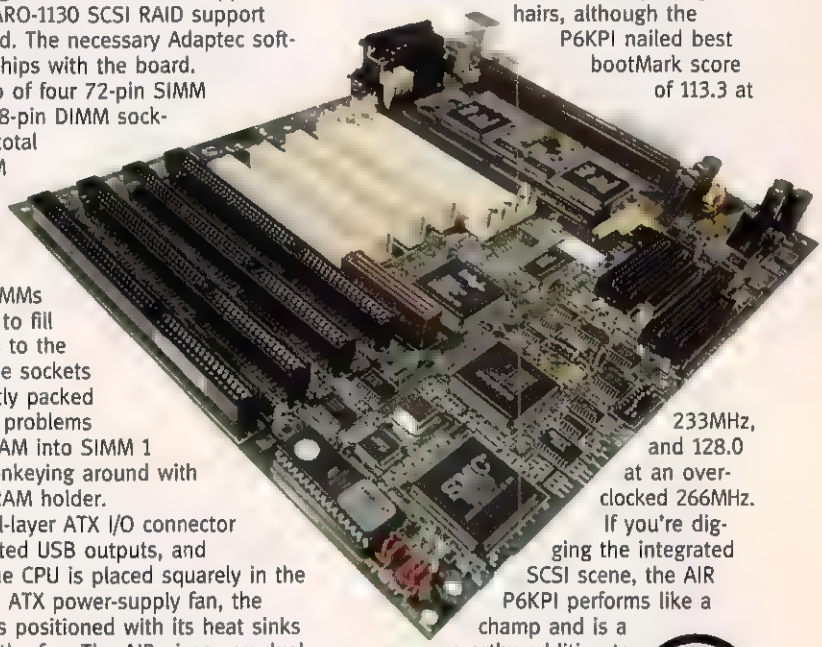
On top of your standard floppy and EIDE interfaces, an Adaptec AIC 7880 Ultra Wide SCSI adapter calls this motherboard home, with a 50-pin 8-bit SCSI interface and 68-pin, 16-bit, female Ultra Wide SCSI port sitting alongside the aforementioned IDE connectors. Seven slots are available: three bus-mastered PCI, three ISA, and one shared PCI/ISA. And the shared PCI slot has an integrated slot that will support Adaptec's ARO-1130 SCSI RAID support adapter card. The necessary Adaptec software also ships with the board.

A combo of four 72-pin SIMM and two 168-pin DIMM sockets maxes total system RAM at 1GB, although you'll need double-buffered DIMMs if you plan to fill the sockets to the rim. But, the sockets are so tightly packed you'll have problems installing RAM into SIMM 1 without monkeying around with DIMM 3's RAM holder.

The dual-layer ATX I/O connector has integrated USB outputs, and although the CPU is placed squarely in the sites of the ATX power-supply fan, the processor is positioned with its heat sinks away from the fan. The AIR gives you dual three-pin minifan power connectors, but they're awkwardly placed at the far end of the motherboard near the bottommost ISA slot! Also, the pins for the power switch, hard-drive LED, and speaker are clumped together so installation can be a bear.

Rather than pullout jumpers, AIR went with DIP switches for CPU speed (maxing out at 300MHz) and SCSI termination. Bus clock speed is set with the CPU speed. All EIDE and SCSI connectors are grouped together for easy access.

The board performs well, garnering first place in three of our benchmarks. The scores were so close, it's like splitting hairs, although the P6KPI nailed best bootMark score of 113.3 at 233MHz, and 128.0 at an overclocked 266MHz. If you're digging the integrated SCSI scene, the AIR P6KPI performs like a champ and is a worthy addition to your system.

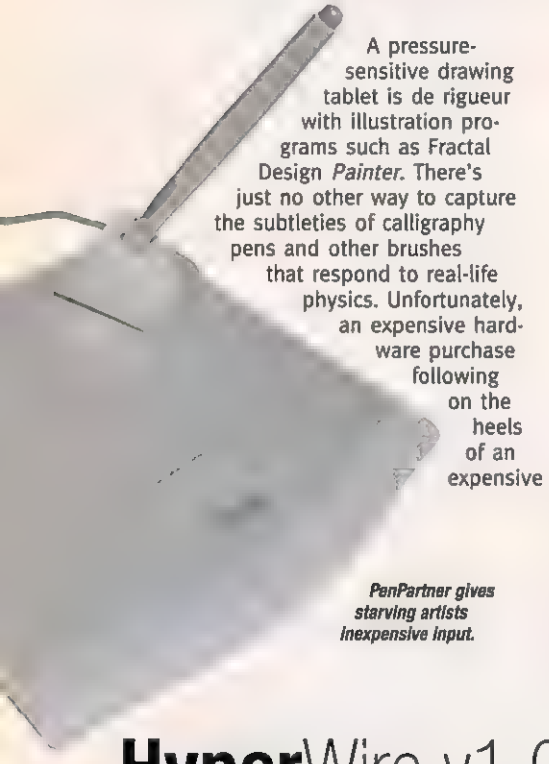


Price *$440*
Company *Advanced Integration Research*
Phone *408.428.0800*
URL *www.airwebs.com*

	Memory Speed (MB/sec)	Quake (fps)	Fastvid Quake (fps)	GLQuake (fps)	DMA Access (MB/sec)	L2 Cache Speed (MB/sec)	MDK Perftest
	233MHz/266MHz	233MHz/266MHz	233MHz/266MHz	233MHz/266MHz	233MHz/266MHz	233MHz/266MHz	233MHz/266MHz
	110.8/122.8	**14.2/14.8**	**23.5/25.9**	28.2/28.3	**48.2/47.4**	243.8/278.6	82/101
	96.4/105.3	14.0/14.5	22.9/25.0	**28.4/28.4**	36.3/34/0	**244.4/279.3**	83/102
	100.7/110.4	13.1/13.5	21.4/23.2	28.2/28.3	44.7/44.8	243.7/278.6	**97/109**

Wacom PenPartner

The artist's answer to mouse infestation



PenPartner gives starving artists inexpensive input.

A pressure-sensitive drawing tablet is de rigueur with illustration programs such as Fractal Design *Painter*. There's just no other way to capture the subtleties of calligraphy pens and other brushes that respond to real-life physics. Unfortunately, an expensive hardware purchase following on the heels of an expensive software purchase can wreck starving artists. Enter the PenPartner, an extremely competent $99 addition to the tablet market.

The tablet foregoes an AC adapter by drawing power from the computer and offers an active area of 4x5 inches and 256 levels of pressure. Aside from its tiny plane (the smallest that Wacom ships) and the lack of extended features, such as transparent overlay and a programmable menu strip, the PenPartner provides all the utility of more expensive Wacom tablets. The accompanying cordless UltraPen rattles slightly, but captures all the nuances of a real-life art tool. Don't like what you've drawn? Flip the UltraPen around and use its pressure-sensitive eraser to nix unwanted pixels (*Painter* automatically switches to the eraser tool with its own set of high-precision variations).

The UltraPen has a single switch to simulate mouse and keyboard buttons. Via a control panel, the switch can be programmed to be anything from a left mouse click to a shift button click, but you'll damn Wacom for not providing two switches for both the left and right mouse buttons. The control panel also gives on-the-fly disabling of the tablet driver. Fortunately, the tablet driver doesn't conflict with most mouse drivers, so you can keep both devices active.

If you're strapped for cash and willing to overlook a few deficiencies, the PenPartner is an excellent tablet. It's incredibly responsive, tracks fine detail, and will accommodate any art project that doesn't require long, sweeping uninterrupted line strokes.

— Jon Phillips

Price $99
Developer/Publisher Wacom
Phone 800.922.2589
URL www.wacom.com

boot verdict 8

HyperWire v1.0

WYSIWYG Java development

TRY IT ON THE DISC

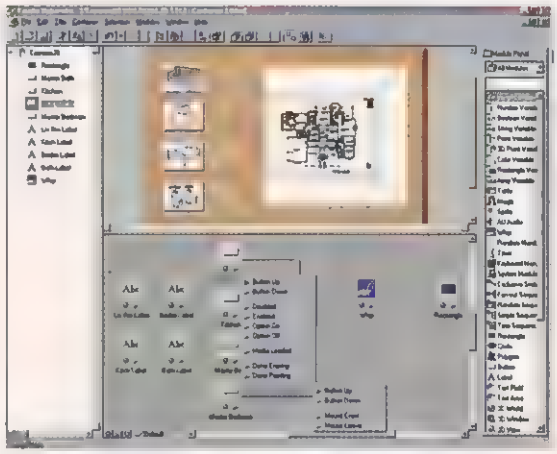
You need Java technology to keep up with the Joneses, right? But you don't know an if-then-else statement from a financial statement? *HyperWire* from Kinetix may be your saving grace. It's essentially a WYSIWYG Java development package with power to spare and room to grow.

The premise is modules and wires. The bevy of components controls every aspect of your code, and—with 47 modules in the arsenal—if you can't find a module to do your thing you probably didn't need to do it in the first place. Each module has commonalities as well as unique options. By filling in request boxes or checking boxes you get incredible flexibility without sacrificing "programming power." (This isn't as cumbersome as one might expect. Many options are defaulted, and dialog boxes are well laid out with consistent icons throughout.) There's a plethora of ingenious tools to clean up your code and help you along the way, as well as 20 examples demonstrating almost every major facet of the program. These will get you on your way significantly faster (although wizards would be appreciated).

Kinetix's open-standard Virtual Reality Behavior Language (VRBL) extends the current capabilities of VRML worlds by adding animations, and line-of-sight, proximity and pick triggers, which give you more interactivity in a scene. The JavaSoft compiler is included, but using Microsoft's compiler, Symantec's Cafe Java, or JIT compiler dramatically improves performance.

Unfortunately there are no manuals. No printed edition, no .pdf file, no .html file, no .txt file. But to *HyperWire*'s credit, there's a pretty robust help file.

Three runtime installs are *HyperWire*'s rise and downfall. In one sense, they speed the execution of the program's Java applets. Conversely, its biggest drawback is that all the fancy Whip! (2D .DXF files) and VRML stuff require the runtime installs supplied, but HyperWire limits these to



HyperWire offers multiple views, each with its own specialty, giving you a much needed overview of your project. Selecting an item in one window will highlight it in the others.

Navigator and *Internet Explorer 3*. Cutting-edge cruisers will be beggin' Kinetix to release new runtimes.

— Daevid Vincent

Price $249
Developer/Publisher Kinetix
Phone 888.497.3748
URL www.ktx.com/hyperwire

boot verdict 7

Lightscape 3.0

Step into the light

What makes *Lightscape* stand apart from the pack of 3D renderers is its radiosity technology. This is based on real-world lighting integrated with a ray-trace renderer. Radiosity alone can't deal with specular and transparency effects, but by combining it with ray tracing, *Lightscape* can.

Lightscape is not modeling software. You'll need to import models from a separate app. Supported formats include DXF and 3D Studio R4, which has been improved to preserve material properties (including textures and mapping coordinates), as well as lights and camera animation paths. *3D Studio Max* import/export plug-ins are available on *Lightscape*'s site.

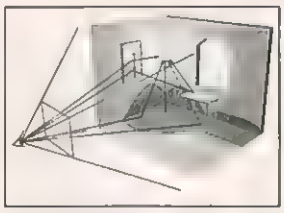
The *Lightscape* lighting model is based on scene physics, and distances between light sources and geometry dramatically affect the final image. Tools provided with *Lightscape* tweak both the diffuse and specular behavior of materials. Set the diffuse behaviors by manipulating the hue, saturation, and values of the reflective color. Manipulating the refractive index, smoothness, and transparency sliders sets the specular characteristics. In addition to basic properties, materials can incorporate texture maps, from procedural and bitmaps sources. Unfortunately *Lightscape* doesn't read procedural textures from imported *3D Studio* files. They must be recreated in the form of intensity (reflectance) and bump (roughness) mapping. Standard projection types align textured materials to the geometry, with mapping modes tiling and clipping textures onto surfaces.

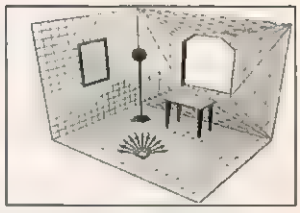
Luminaires are primitives that represent the physical appearance and the photometric characteristics of a light. The new version supports three basic light classes—point, linear, and area lights—with 18 lamp types used to approximate the spectral characteristics of each. Intensity distributions fall into four categories: isotropic, spot, diffuse, and photometric web (which is used by manufacturers in the lighting industry). An editor is available to edit these distribution patterns and import photometric data from industry file formats.

Optimizing models for radiosity processing means the geometry can no longer be manipulated. *Lightscape* handles light variations with meshes that are broken down based on the complexity of the illumination. Beginning with a coarse mesh of a few elements, adaptive subdivision refines locally where high illumination gradients are detected. You can control the adaptive subdivision using several parameters, balancing the trade-off between computation time and image accuracy. Don't worry: presets are available to help newcomers. The actual process of calculation is completed in successive iterations, first selecting the biggest light source and calculating its contribution to all of the scene's surfaces. Once all the primary light sources are processed, *Lightscape* switches to the inter-reflections of light between surfaces.

Lightscape can halt light propagation at any time, with current light source contributions making a percentage distribution to all of the surfaces in the environment. Refinements can then be made and processed from this point. The illumination values computed during the simulation are stored within the surfaces in the 3D environment, with the unique benefit of being view-independent.

Lightscape 3.0's radiosity technology integrates real-world lighting with a ray-trace renderer. The result: truly realistic lighting effects.



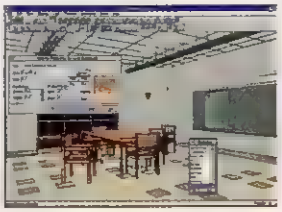


The image (left) shows the ray-tracing algorithm Lightscape 3.0 *employs. The diagram (right) illustrates radiosity, which is* Lightscape's *specialty.*

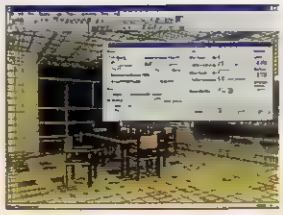
Lightscape adds value beyond the soft-edged shadows and color-bleeding between surfaces. Its lighting analysis tools and design data, gleaned from the ability to use real-world lighting configurations, are the real payoff for architectural designers. Game and VRML developers will be more interested in the mesh-to-texture tool, which converts radiosity into texture maps, for models with a significantly reduced polygon count and a photorealistic look.

— *Dana Church*

Lightscape *offers controls aplenty for importing DXFs.*



Once you've imported, go through your scene and specify materials.



When it's time to set radiosity, Lightscape *shows its true colors.*

Price *$495*
Developer/Publisher *Lightscape Technologies*
Phone *800.859.9643*
URL *www.lightscape.com*

boot verdict 7

NEC **Ready** 9725

Junior's first (and last) computer

Say hello to NEC's "multimedia computer"—another box for the family that sacrifices power for convenience and a lower price. The Ready 9725 ships with Intel's nimble Pentium 233 with MMX, but is stymied by bad 3D, cramped interior design, and a kiddy-friendly desktop wizard named Merlin that saps overall performance.

The machine is far from a total dog, but it breaks our hearts to see good components sharing space with OEM compromises.

In basic processing power, the 9725 doesn't compete with systems boasting the same CPU. It bootMarked at 51.7—disappointing considering we just reviewed two P233 MMX systems that scored 61 and 61.8. Blame the 10-point plummet on only 256K of L2 cache (you can't add more) and the gluttonous Merlin wizard, which can't be turned off on the fly or removed via Add/Remove Software.

The Ready ships with S3's 2MB ViRGE DX soldered to a proprietary LPX motherboard that uses Intel's 430VX PCIset. We'll spare S3 the litany of verbal ass-whompings, but suffice to say, benchmarks suffered. During Win95 video playback, dropped frames exceeded 50 percent, and, once again, we couldn't run our Direct3D gaming test due to poor driver support. S3 says its latest drivers pamper Direct3D, but they're only available to manufacturers and can't be found on NEC's web site.

Our *Quake* test ran at a sound 15.3fps, but (you guessed it) there's no VESA 2.0 support. Sure, *boot* readers know the higher-res fix in DOS gaming, but the Ready's audience will likely suffer without ever knowing that a better world exists, and that's a crying shame.

Gamers who want better video and 3D can disable the ViRGE, untwist the thumbscrews on the wicked black minitower, and slide better silicon into any of three open PCI slots (one is shared). The Ready's ISA universe is much less inviting. The slot right against the motherboard can only accommodate half-length cards because the CPU blocks about two inches of real estate. You can't use the second ISA slot because it's babysitting the Aztech fax/modem/sound card, which is an inch too long to snuggle next to mommy. That leaves you with the shared slot—but the idea of installing an ISA device into a shared slot with PCI potential is repugnant.

Any *boot* reader buying this system will likely ditch the modem/sound solution. On the modem side, it's x2-compatible, but on the sound side we're talking 16-bit FM synth and disappointing hardware wavetable.

Thankfully, hard disk and CD-ROM performance is outstanding. Both parts went hog wild during testing, especially the NEC CD-ROM drive, with transfer rates that can't even be contained in our benchmarking chart. If you grow out of the 4.3GB Maxtor CrystalMax hard disk, you can expand into one of the two open 5 ¼-inch bays.

The Ready 9725 is a machine for first-time buyers who *need* to believe they're buying primo technology. *boot* readers would surely be better served by buying one of NEC's awesome PowerPlayers, or a well-tuned P233 MMX system.

As it stands, the Ready's CPU sits dejected in the motherboard, wondering who teamed it up with all this riffraff.

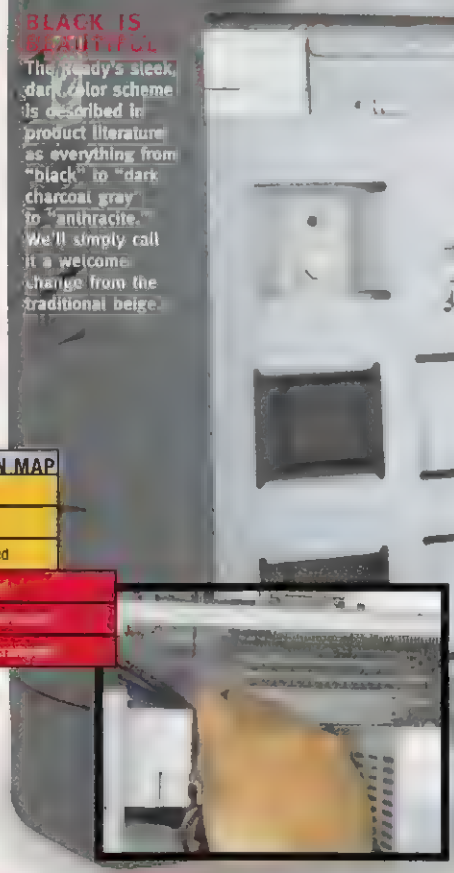
— Jon Phillips

ANGRY ESTER

Merlin is your animated guide through painfully obvious desktop tours. Unfortunately, he creates system overhead and can only be removed by deleting subdirectories. (Meaning, most beginners will suffer his power-hogging for as long as they own the computer.) NEC says that a future system Merlin will be removable via a control panel. Benchmarks improved when we ripped the wizard from the hard drive, and 3D MMX test & WinZip shaved in the C++ CPU/Disk drill, and a full 3 points added to the basic bootMark.

BLACK IS BEAUTIFUL

The Ready's sleek, dark color scheme is described in product literature as everything from "black" to "dark charcoal gray" to "anthracite." We'll simply call it a welcome change from the traditional beige.



TIGHT FIT

Big beefies may have a problem with memory upgrades because the four SIMM sockets are hiding in a dark little hovel between the power supply and riser board. The clearance is only 1¾ inches. Start measuring your hand.

under the hood

THE BRAINS

CPU	Intel Pentium 233MMX
L2 Cache	256K (external pipeline burst)
RAM	32MB EDO (128MB max mem)
Motherboard	NEC proprietary LPX formfactor based on Intel Orlando, uses 430VX PCIset)

THE BRAWN

Hard Drive	Maxtor CrystalMax 1080 4.3GB IDE
CD-ROM	NEC CDR-1600 16x IDE
Expansion Bus	Two PCI, two ISA, one PCI/ISA shared
I/O Ports	Two USB, one serial, one parallel, one S-video-in, one video-in

THE BEAUTY

Display	Optional 15-inch NEC CS500 with built-in speakers ($379)
Sound	Aztech AZT2320R2, 16-bit FM synth/hardware wavetable
Video	S3 ViRGE DX with 2MB EDO DRAM onboard motherboard
Speakers	Custom Harman/Kardon built in to monitor
Communication	Fax/Modem Aztech x2 56-6Kbps

EXPANSION MAP

PCI	Free
PCI	Free
PCI	Free/shared
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

THE BUNDLE Windows 95 OSR/2 ▮ Intel Video Phone ▮ NEC Connections Telephony ▮ Pod (MMX) ▮ The Third Dimension (MMX) ▮ The Family Doctor (MMX) ▮ Blockbuster Entertainment's Guide to Movies and Videos (MMX) ▮ Sega Sonic ▮ Quicken SE ▮ McAffee's WebScan and VirusScan ▮ Microsoft Works ▮ Publisher ▮ Money ▮ Encarta ▮ Bookshelf

boot	down
:47	:12

WE'LL TAKE THE MERRIMAC

This is an optional monitor you'll definitely want to give a miss. At $379, the inverse shadow mask NEC CS500 offers good enough specs (0.28mm dot pitch, 1024x768 @ 80Hz, 1280x1024 @ 60Hz), but comes with confusing controls, and only 13.7 inches of viewable screen area. Worse yet, the "custom" Harman/Kardon speakers lack bass entirely.

NEC Ready 9725

real-world benchmarking

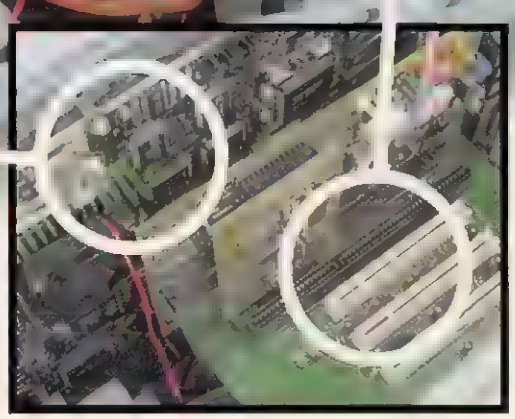
CPU/MOTHERBOARD	*bootMark*	51.7
WIN95 APPS	*SYSmark32*	165
DIRECT 3D	*Terramark*	composite: would not run
HARD DRIVE	*Adaptec ThreadMark v1.0*	MB/sec 3.24
CD-ROM	*CD Tach/Pro v1.65*	K/sec 2152
WIN95 VIDEO	*VidTach v1.52*	% played 48.6
DOS GAMING	*Quake v1.06*	fps 15.3
DIRECTX GAMING	*MDK PerfTest v1.4*	98
MMX PROCESSING	*DeBabelizer Pro*	secs 327
CPU/DISK	*Microsoft Visual C++ compile*	secs 223

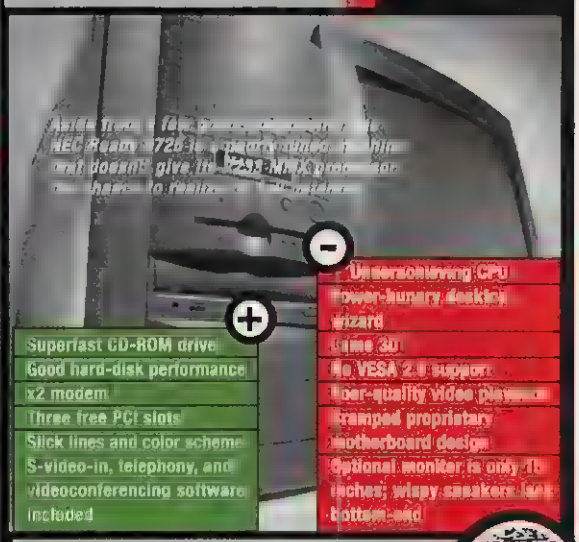
PCI WONDERLAND

Talk about cramped: the daughtercard on the modem/sound solution just *barely* touches the third ISA slot. But at least you get to play with three open PCI slots. Thank you, NEC!

PROCESSOR CREEP

In many ways, the Ready's styling resembles the PowerPlayer series—but not in proprietary motherboard design. This time, the CPU has moved over a few inches to block all but the shortest of cards in the first ISA slot.





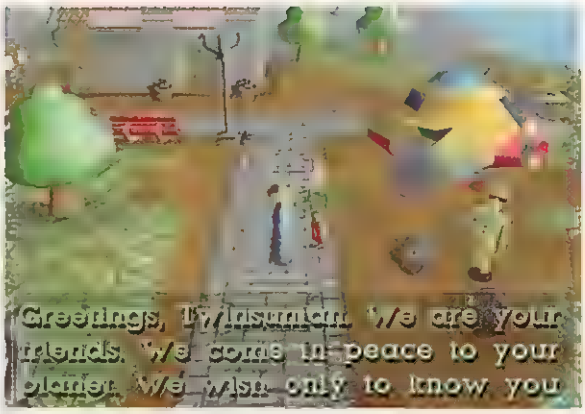
Price $2,399
Company NEC Computer Systems
Phone 800.338.9549
URL www.nec.com

boot verdict 6

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

Twinsen's **Odyssey**

Big trouble in little Zeelich



Twinsen's Odyssey has goofy 3D graphics and deceitful aliens—what more could you ask for?

In *Twinsen's Odyssey*, French designer Frederick Raynal concocts a worthy successor to his earlier *Relentless*.

Twinsen's huge pre-rendered fairy-tale world is presented in 3D at 640x480 and is surprisingly vibrant in just 256 colors. A static camera viewpoint allows high polygon counts for rounded contours. Outdoor locations can cycle through four camera angles or zoom out to a very useful overhead perspective.

The game is laid out as a series of overlapping quests. You gotta find a cure for your pet dinosaur, but to do that you gotta become a magician, and to do that you gotta pass three tests for which you gotta gather items from remote islands, and so on through deserts and dungeons and alien planets.

Fixed viewpoints trade off well for lavish scenery.

Humorous touches keep the quest from going stale. The invading Esmer aliens, for example, blithely affirm undying friendship while sniping at you disguised as trash cans and cacti.

Puzzles often depend on switching Twinsen through alternate behavior modes. Sporty mode may let you run through a timed door, while Discreet mode lets you tiptoe past a fireball-launching trap.

Despite the overall brilliance of the visuals, character animations are stiff, hampering the Aggressive mode combat. Twinsen throws a magic globe, but you can't tell precisely which way he's facing. Fortunately, most combat can be avoided.

Technically, this game is no breakthrough. But the fanciful graphics, dry wit, and logical puzzles make *Twinsen's Odyssey* a tour worth taking.

—Frank Lenk

Price $50
Developer Adeline Software
Publisher Activision
Phone 310.473.9200
URL www.activision.com

Diamond **Gyro**Mouse

Doin' the wrist-wiggle

The GyroMouse suffers from a split personality—it's a standard two-button mouse by ground and a handheld remote-control pointing device by air, and lag grounds it either way.

GyroMouse consists of the aforementioned pointing device, a cradle that acts as resting place and recharger for the mouse's nickel-cadmium battery, and a small power-supply brick, which plugs into the cradle. The notched underside of the mouse provides a place to rest your twitchy index finger.

Weighing 5½ ounces, the mouse fits comfortably in either hand (although smaller hands may have a problem getting a grip on the rodent) and is armed with three buttons, two on top and a loner underneath. Why? 'Cause when the GyroMouse isn't sliding around your desktop as a mild-mannered mouse, lifting it in the air and activating the bottom button engages internal solid-state gyroscopes that turn wrist twists into cursor movement (similar to Sony VisionTouch's AirEgg reviewed in *boot* 07). The gyroscopic motion emulates cursor movement, so you can work that mouse regardless of the OS.

Don't worry about pesky cords—the GyroMouse works on radio-frequency signals, so you can fly the friendly skies sans line-of-sight and cables. Operating at 49MHz, each GyroMouse system can handle up to eight channels and we coaxed well over 15 feet of usable range—even through walls!

The cradle is saddled with all the wiring; the PS/2 connector—a DB-9 adapter is also included—and power cable cluttering your desktop.

Installation is a snap, and the GyroMouse uses the default Microsoft or Logitech mouse drivers, so there's no software installation. The NiCAD batteries will last about eight hours.

Latency is the number-one killer among wireless mice, and here's where the free-flying GyroMouse loses altitude. Free-roving cursor movement is lag-free, but when you drag there's a split-second pause between the time you move the mouse and cursor movement.

Throw the GyroMouse in the air and wave it like you just don't care.

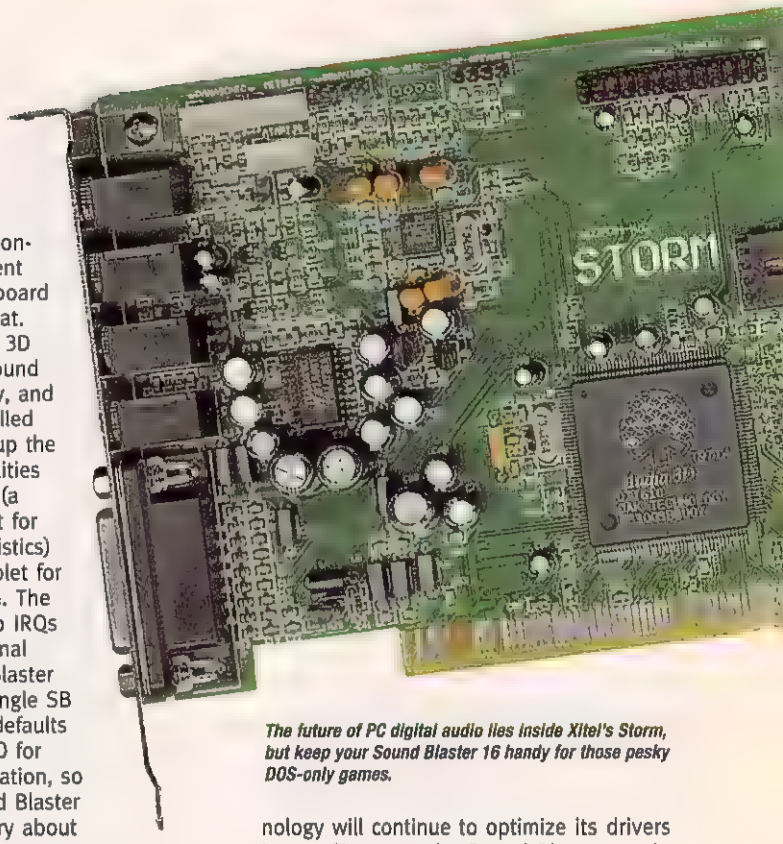
Also, learning to work the airborne GyroMouse can be a trying affair.

– Andrew Sanchez

Price $99
Company Diamond Mulitmedia
Phone 800.468.5846
URL www.diamondmm.com

Xitel **Storm**

A slight sonic breeze



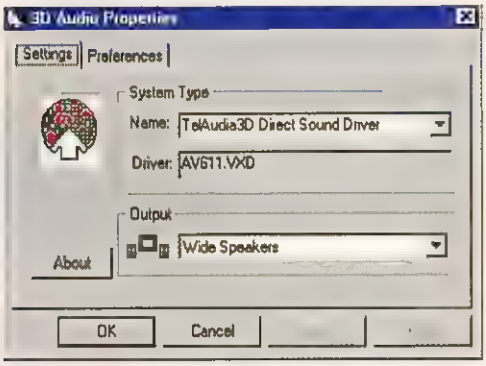
The future of PC digital audio lies inside Xitel's Storm, but keep your Sound Blaster 16 handy for those pesky DOS-only games.

In the middle of a sound card maelstrom, Xitel's Storm tries to blow you away over the PCI bus. But, if you're expecting an all-in-one solution, be warned: the Storm delivers a digital cloudy day.

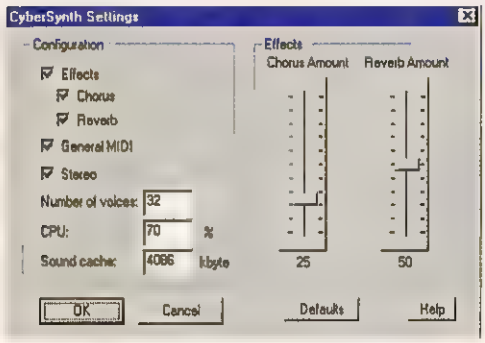
The Storm is a Win95 sound solution with multichannel, 3D-positional digital sound handled by Oak Technology's 36 MIPS OPI-610 Audia3D chip. The HSP synthesizer gives full General MIDI-compliant sound patches for MIDI playback (4MB of your system RAM acts as patch storage). Sound Blaster emulation is accomplished via a Win95 DOS box, so old-school DOS games requiring that command prompt will need a real Sound Blaster to get digital voices singing. In addition to DirectSound and Aureal A3D HRTF support, the Storm is among the first cards to fully comply with AC'97 specifications.

The Storm has 1/8-inch stereo mini-ports for line-in, mic-in, line-level outputs, and amplified speaker outputs, as well as a standard joystick port. An internal wavetable header connector is also present in case a daughterboard floats your MIDI boat.

Three drivers for 3D positional audio, Sound Blaster compatibility, and game port are installed when you first fire up the Storm. Software utilities include *CyberSynth* (a control panel applet for your MIDI characteristics) and a 3D audio applet for configuring the card. The Storm takes up two IRQs (one for 3D positional audio and Sound Blaster emulation) and a single SB emulation DMA. It defaults to IRQ 9 and DMA 0 for Sound Blaster emulation, so if you have a Sound Blaster onboard, don't worry about conflicts (unless something else is using those resources already). If you're throwing your Sound Blaster out on the curb, you'd best adjust those settings because many older games don't recognize them. So, adding the Storm to a Sound Blaster 16 system results in multiple addresses used, three IRQs, and three DMAs—you've been warned.



With proper speaker placement and optimal audio settings, you may experience the immersive sounds of DirectSound 3D.



CyberSynth is your one-stop MIDI adjustment shop where you can contour reverb and chorus settings, among other things.

MIDI performance is impressive, with authentic piano strikes and string arrangements that are smoother and more natural than Diamond's Monster Sound 3D (reviewed in *boot* 11). The snappy percussion patches also rock. The only rough spots are the occasional twangs of synthesized horns and other uneven patches.

Our breezy feeling of PCI-sound happiness was cut short by emulation. Remember, this card is supposed to emulate 8-bit Sound Blaster only—most modern DOS games require a 16-bit/high DMA setting in order to run correctly—and the Storm makes no claims to be 100-percent Sound Blaster compatible. *Quake* was the only game that recognized the Storm, spewing clean but flat-sounding digital effects, while HMI's Sound Operating System, and the BUILD engine's sound setup failed to recognize the card claiming an invalid DMA channel. Oak Technology will continue to optimize its drivers in an effort to make Sound Blaster emulation a less painful experience.

Under Win95, things are better, with all DirectX games playing clearly and crisply. The ability to play up to eight mono or stereo digital sounds (at different sampling rates) in hardware without bogging down the host CPU will get performance monkeys hot and bothered—Intel Media Benchmark reported 8.56 percent CPU utilization when playing an MPEG audio file. While Win95 3D positional audio-enhanced games are few and far between (LucasArts *Outlaws* being one of the few), DirectX 5.0's release should mean more games taking advantage of 3D sound. But the Storm only has solo stereo outputs (per Aureal 3D specification), as opposed to the front and rear outputs on the Monster Sound 3D, so optimal speaker placement is imperative for optimal 3D immersion. Prepare to spend a lot of time adjusting your speakers.

PC'98 specs call for the abolition of the ISA bus, and Xitel's Storm is a forceful message to the masses. Just don't abandon that Sound Blaster 16 just yet.

— Andrew Sanchez

Price $99
Company Xitel
Phone 512.331.5544
URL www.xitel.com

Magix **Music** Studio v3.0 **deLuxe**

How do they do it so cheap?

Music Studio deLuxe is the bargain of a lifetime. It's not just one, but two pro-caliber programs for less than $100.

MIDI Studio is a 16-track audio and 256-track MIDI sequencer conforming to the increasingly popular clip- or object-based method of arrangement. These clips can be named—but not colored—and almost every track property is easily modified. Objects can be snap-aligned to bar, 4, 8, or 16th note boundaries.

Editing options include event, piano roll, and notation. Even system-exclusive messages can be tinkered with. All the major functions you'd expect in a sequencer are done here, and done well.

A monitor LED lights up when any activity occurs on a given track, but currently only one track can be armed to record at a time. Digital audio file editing is impossible directly in the program, however, and this can be annoying, but at least samples can be modified in the Audio Studio.

Audio Studio is essentially equivalent to the scaled down Pro version of Samplitude Studio (see review in *boot* 12). Highlights include eight mono tracks with global sample rate conversion and a single-band parametric EQ (+/-10dB) on the fly. As for effects to make your samples more burley, there's a 5-band parametric EQ, gate, High/Low/Band-pass filter, noise/hum reduction, echo/delay, reverb and time-stretch/resample/pitch-shifting processors. The virtual keyboard allows for chording, and there are multi-patch lists as well as music notation. Not to mention the fabulous three-pane looping window.

A normal version is also available with half the number of audio and MIDI tracks. *Music Studio* fully competes with packages costing four times as much and don't offer nearly as much bang for the buck.

— Daevid Vincent

Cosmetically and feature-wise, Magix Music Studio is a robust program for the price.

Price *$50;*
$90 deLuxe version
Developer *SEK'D*
Publisher *Magix Entertainment Corp.*
Phone *310.656.0644*
URL *www.magix.com*

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ATI	11	85	www.atitec.com	Memory Direct	120	240	800.486.2447
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boot

Micro **Express** **Microflex** K6/200 MMX

Tastes great and is less filling

The Microflex K6/200 MMX is brimming tasty hardware treats and AMD's K6 processor is the main course. While the $2,299 system is worth salivating over, Micro Express cut corners to make its magical price point, which may leave you a little hungry.

Micro Express's made-to-spec P5TX-A ATX motherboard sits in a mid-size tower. Sporting 512K of soldered-on L2 cache, the P5TX-A is one of the few 430TX boards we've seen that has jumper settings for 75MHz (see sidebar). Three 168-pin DIMM slots can get you into 256MB heaven (twin 32MB DIMMs shipped with this unit), while six usable slots take care of expansion needs. A power-user's wish list of cards fills these slots, including tag-team display action from Matrox's 4MB Millennium and Diamond's 3Dfx-powered Monster 3D.

Creative Lab's AWE64 Gold and the lovable Altec Lansing ACS45 subwoofer/satellite system handle the audio.

Quantum's 2.0GB Fireball ST2 Ultra DMA EIDE hard drive and Sony's CDU511 CD-ROM drive round out the storage devices. Drive bays are relegated to one 3.5-inch and two 5.25-inch bays. A Princeton EO76 17-inch monitor handles display duties. Internally, all cables are neatly tied down and kept out of harm's way.

Design details flaw this otherwise grand presentation. The AWE64's SPDIF blocks the shared PCI/ISA slot. *Zoinks!* Micro Express's next motherboard should integrate the USB ports into the ATX I/O connector, freeing room for the SPDIF. While the DecTech CPU cooler keeps the K6 from breaking a sweat, the lack of direct ATX power-supply cooling fan is distressing because the motherboard's transistor heat sinks sit right next to the CPU. Also, the power LED's header connector on the motherboard blocks the top-most PCI slot from obtaining full-length status. And what's up with the tiny 2GB hard drive and paltry Apache Cyberpower 33600 voice/fax modem? Where's the 56.6Kbps beef? And the lack of DOS device drivers only exasperates the situation.

The system performs remarkably well, scoring a cool 84.9 on the bootMark. The Matrox/AMD combo pushed SYSmark32/Win95 application performance past Intel's flagship P233 MMX processor and well into Pentium II territory, posting a 219. But, the floating-point curse comes back to bite K6 in the butt, with *Quake* offering only 12.4fps, despite built-in VESA 2.0 compliance. Also, *MDK*'s PerfTest returned an equally anemic 72. *GLQuake* is the preferred mode-of-frag, but even then it fell a hair short at 27.9fps (a P233 MMX machine does 28.4). Terramark/Direct3D performance rocked hard, thanks to 3Dfx's magic. Hard drive and CD-ROM performance fell within acceptable ranges. Our MMX/*DeBabelizer* Pro test dropped in at 346 seconds—19 seconds faster than a P200 MMX—and Microflex's 153-second Microsoft C++ compile edged out the 168-second time a P200 MMX produced.

Dollar-for-dollar, the Microflex K6/200 MMX dishes decent Win95 performance.

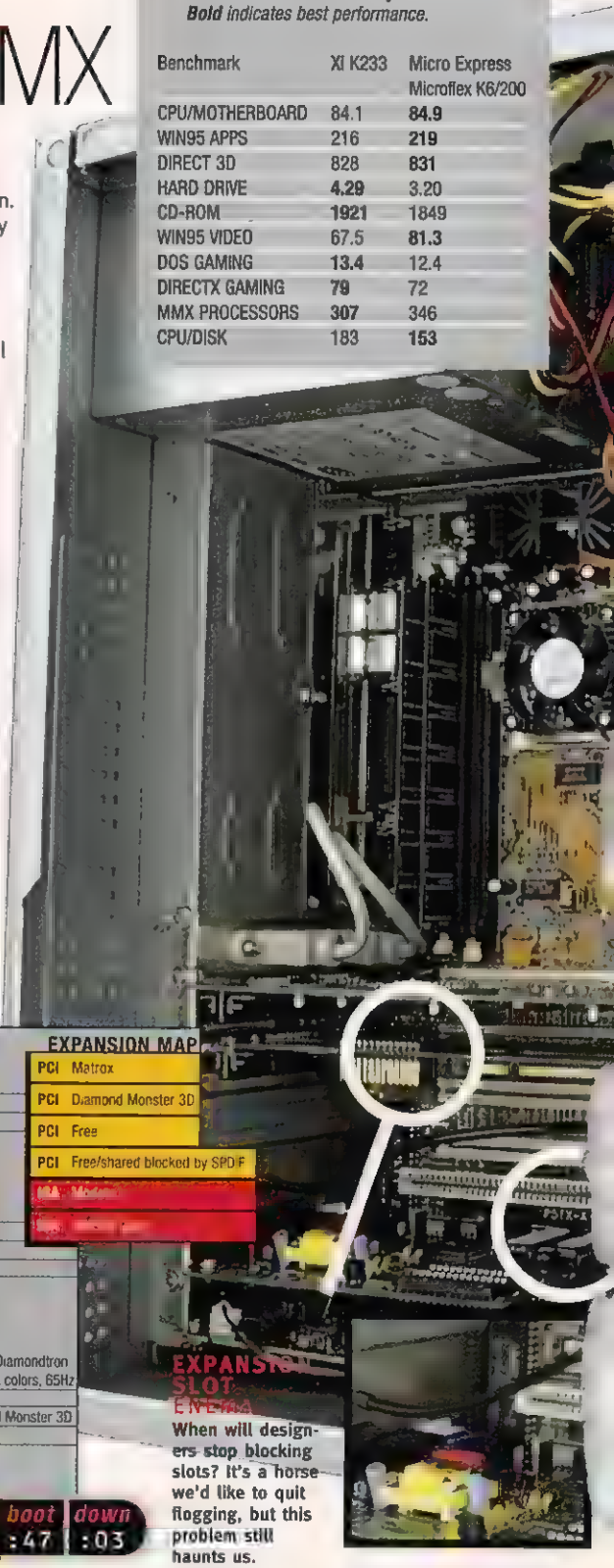
— *Andrew Sanchez*

Xi vs. Micro Express

Xi vs. Micro Express—let the action begin! To see how much difference vendors make in designing AMD systems, we pitted this Microflex against the hardcore hardware version of Xi's K233 MTower machine (reviewed in boot 11). The Xi was armed with the same video subsystem, but had AMD's K6/233 CPU and only 32MB of RAM.

***Bold** indicates best performance.*

Benchmark	Xi K233	Micro Express Microflex K6/200
CPU/MOTHERBOARD	84.1	**84.9**
WIN95 APPS	216	**219**
DIRECT 3D	828	**831**
HARD DRIVE	**4.29**	3.20
CD-ROM	**1921**	1849
WIN95 VIDEO	67.5	**81.3**
DOS GAMING	**13.4**	12.4
DIRECTX GAMING	**79**	72
MMX PROCESSORS	**307**	346
CPU/DISK	183	**153**



under the hood

THE BRAINS

CPU	AMD K6-PR200MHz MMX
L2 Cache	512K external pipe line burst
RAM	64MB SDRAM (256MB maximum)
Motherboard	Micro Express P5TX-A ATX Rev 1.2

THE BRAWN

Hard Drive	Quantum Fireball ST-2 2GB UltraDMA EIDE
CD-ROM	Sony CDU511 EIDE
Expansion Bus	Three PCI; two ISA; one shared PCI/ISA
Modem	Apache Cyberpower 33600 voice/fax
I/O Ports	Two serial, one parallel, two USB, one SPDIF

THE BEAUTY

Display	Princeton EO76 17-inch (16.1-inch viewable) Diamondtron monitor, 0.25mm dot pitch, 1600x1200 @ 64k colors, 65Hz
Sound	Creative Labs AWE64 Gold
Video	Matrox Millennium with 4MB WRAM, Diamond Monster 3D
Speakers	3Dfx Voodoo with 4MB EDO-DRAM
Others	Altec Lansing ACS45 Microsoft Mouse, microphone

THE BUNDLE Windows 95 OSR/2 | Device drivers for cards

boot down :47 | :03

EXPANSION MAP

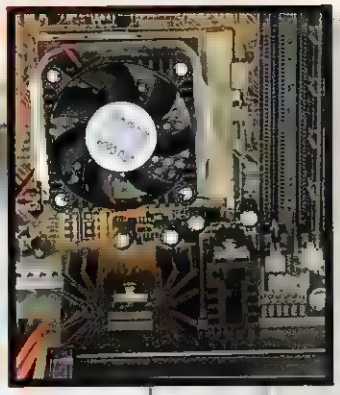
- PCI Matrox
- PCI Diamond Monster 3D
- PCI Free
- PCI Free/shared blocked by SPDIF
- [illegible]
- [illegible]

EXPANSION SLOT ENEMA

When will designers stop blocking slots? It's a horse we'd like to quit flogging, but this problem still haunts us.

SO HOT, SO COOL, YOU'RE COOL, YOU'RE HOT

A single CPU fan is all that stands between your K6 and thermal overload. While CPU temperature never reached critical mass, an ATX power-supply fan would easily alleviate thermal worries.



THREE'S NOT A CROWD

If you wanna pony up the moola for those massive 64+MB DIMMs, then you may just reach Intel's 430TX 256MB system RAM limitation. Two are filled for 64MB satisfaction.

AW, SHUCKS

A genuine Creative Labs AWE64 Gold calls this computer home. With 100 percent Sound Blaster compatibility and wavetable synthesis galore, it's about as good as an ISA sound card's gonna get, at least, until Windows 98 and DirectX 5.0 changes the digital sound scene forever.

Speed kills (or corrupts your display)

Intel's official response on 75MHz is that the 430TX doesn't support speeds past 66MHz, although some motherboard manufacturers do design boards with the 430TX and jumper settings to go past 66MHz. Micro Express's motherboard has the jumper settings, so we had to try overclocking this bad boy.

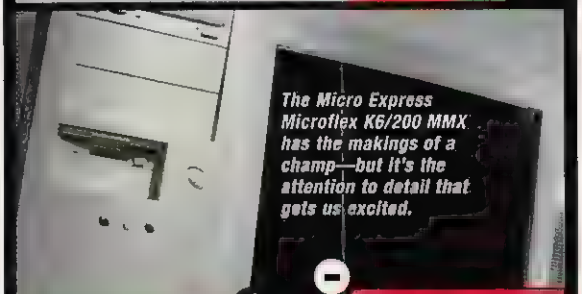
Unfortunately, the K6 is too friendly toward jumper-spanking. While the system rebooted and reported the processor running at 225MHz, we never made it past the Win95 splash screen. The OS refused to boot.

It may have been the PCIset talkin', or the CPU, but one thing's for sure—this system ain't goin' faster than it already is.

real-world benchmarking

Micro Express Microflex K6/200 MMX

CPU/MOTHERBOARD	*bootMark*	84.9
WIN95 APPS	*SYSmark32*	219
DIRECT 3D	*Terramark*	composite 831
HARD DRIVE	*Adaptec ThreadMark v1.0*	MB/sec 3.20
CD-ROM	*CD Tach/Pro v1.65*	K/sec 1849
WIN95 VIDEO	*VidTach v1.52*	% played 81.3
DOS GAMING	*Quake v1.06*	fps 12.4
DIRECTX GAMING	*MDK PerfTest v1.4*	72
MMX PROCESSING	*DeBabelizer Pro*	secs 346
CPU/DISK	*Microsoft Visual C++ compile*	secs 153



The Micro Express Microflex K6/200 MMX has the makings of a champ—but it's the attention to detail that gets us excited.

+

- Great subsystem performance
- Inexpensive
- Excellent [illegible]
- Altec Lansing ACS45 speakers
- ESA 2.0 support
- AWE64 Gold

−

- Puny hard drive
- Floating point performance not up to Intel standards
- SPDIF blocks PCI slot
- No DOS drivers
- 33.6Kbps modem in a 56.6Kbps world
- No ATX power-supply fan for CPU

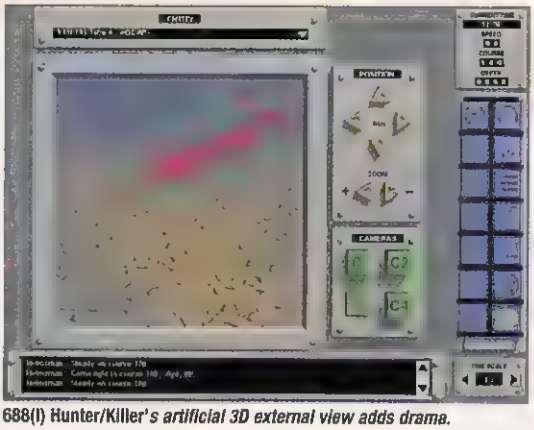
Price $2,299
Company Micro Express
Phone 714.852.1400
URL www.wpages.com/microexpress

boot verdict **7**

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

688(I) **Hunter**/Killer

Diver down



688(I) Hunter/Killer's artificial 3D external view adds drama.

Being deep-sixed in an airtight steel drum isn't everybody's idea of wild excitement. But *688(I) Hunter/Killer* simulates the experience to near perfection.

Through a series of abstract displays, you experience real submarine warfare. The key is the sonar displays. Readings from towed and fixed sonar arrays are presented on a "waterfall" graph, then interpreted on the Target Motion Analysis screen, with course, range, and speed in turn fed into torpedo firing control.

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
Win95 Native
DirectX
DirectDraw DirectSound
MMX Enhanced

Much of this can optionally be handled by virtual crew members, but even so, the learning curve is near vertical. Fortunately, the designers included print, mission, and movie tutorials. When you're ready, there's a good selection of missions: 11 stand-alone scenarios and another 15 scenarios that can be played either singly or in campaign sequence. Enemy AI is competent, but you can also go multiplayer: up to eight players at a time over IPX network or Internet, or two players by modem. A very detailed mission builder lets you easily place allies, enemies, waypoints, and interactive events on a map view.

About the only place absolute realism has been compromised in favor of playability is the godlike external 3D view where you can actually see enemies getting hit, although the graphics are hardly cutting-edge. If not quite the ultimate sub simulation, *688(I) Hunter/Killer* is an excellent base for future elaboration. It achieves a good play balance and will make the gaming sub-culture very happy.

— Frank Lenk

Price $60
Developer Sonalysts
Publisher Electronic Arts
Phone 800.245.4525
URL www.janesea.com

Optiquest V95

Nineteen inches of glory

The Optiquest V95 is an amazing piece of work. It fits 19 inches of screen real estate into a case just a tad heftier than a typical 17-incher, delivers superb picture quality and the ability to sync to very high resolutions, and costs gobs less than even the cheapest 21-incher. There's little more you could ask for in a monitor, whatever the price.

The on-screen menus are clear and easy to use, and provide nearly as many adjustments as some of the professional monitors we've looked at. In addition to the old standbys (brightness, contrast, position, and size), there are adjustments for pin cushion, pin balance, trapezoid, parallelogram, tilt, zoom, color temperature (including a custom user setting), moiré removal, and menu position. Despite all this tweakability, the V95 has very reasonable default settings, requiring only minor adjustments to get the best picture.

Pretty picture: The Optiquest V95 gives you nearly the size of a 21-inch monitor for nearly the price of a high-end 17-inch monitor. The "V" stands for "value."

Picture quality is excellent, with only a few minor gripes. The colors aren't as bright as the best pro screens we've seen, and the black level isn't as deep. We also noticed that at high resolutions and refresh rates, sharp edges begin to blur. Dropping to 1280x1024 at 75Hz rather than 86Hz restores edge-to-edge sharpness to the picture. High-resolution 1600x1200 at 60Hz is amazingly clear and usable as well. Color convergence is flawless, even in the corners, and moiré patterns are nonexistent.

This monitor is, without a doubt, the best balance of size, features, and quality that can be found for under $1,000. Forget 17-inch screens; the day of the 19-incher has arrived. And thanks to the Optiquest V95, it's a happy day indeed.

— Chris Dunphy

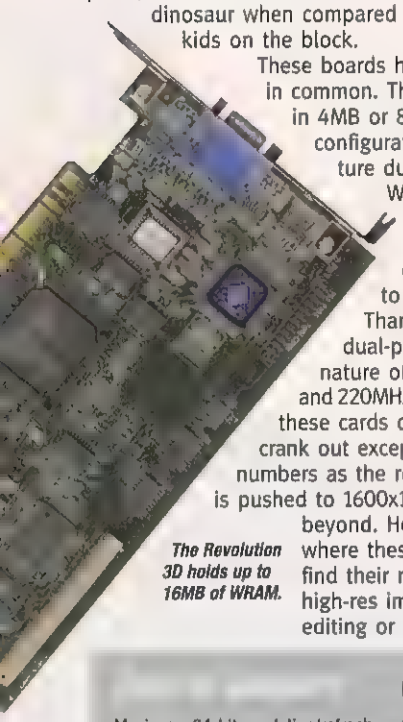
Tube	*19-inch shadow-mask CRT (18-inch viewable)*
Dot Pitch	*0.26mm*
Maximum Res	*1600x1200 @ 76Hz 1280x1024 @ 88Hz*
Horizontal Frequencies	*30kHz - 95kHz*
Vertical Frequencies	*50Hz - 150Hz*
Case Dimensions (HxWxD)	*17x17x18 inches*
Weight	*48.4 pounds*
Plug-n-Play	*Yes; DDC Levels 1, 2B*
Emissions	*MPR-II, TCO*
Power Management	*VESA DPMS (150W, 30W, 8W, 8W)*

Price $995
Company Optiquest/ViewSonic
Phone 800.843.6784
URL www.optiquest.com

Matrox **Millennium II** vs. Number Nine **Revolution 3D**

Past glory not relived

Both Matrox and Number Nine were once regarded as the best of the best in the graphics-card world. But the world has changed. Their boards, the Millennium II and the Revolution 3D respectively, attempt to regain past glory, but sadly, compromises abound. Though they each have their place, each card looks like an expensive dinosaur when compared to other kids on the block.



The Revolution 3D holds up to 16MB of WRAM.

These boards have a lot in common. They come in 4MB or 8MB basic configurations, feature dual-ported WRAM memory, and can be expanded to 16MB. Thanks to the dual-ported nature of WRAM and 220MHz RAMDACs, these cards continue to crank out exceptional 2D numbers as the resolution is pushed to 1600x1200 and beyond. Here is where these cards find their niche. If high-res image editing or CAD is your thing, these cards are hard to beat. The only flaw in the 2D performance was an inexplicably low 79 on our DirectX *MDK* benchmark for the Millennium II, and the Revolution 3D lagged in our VESA 2.0 *Quake* tests.

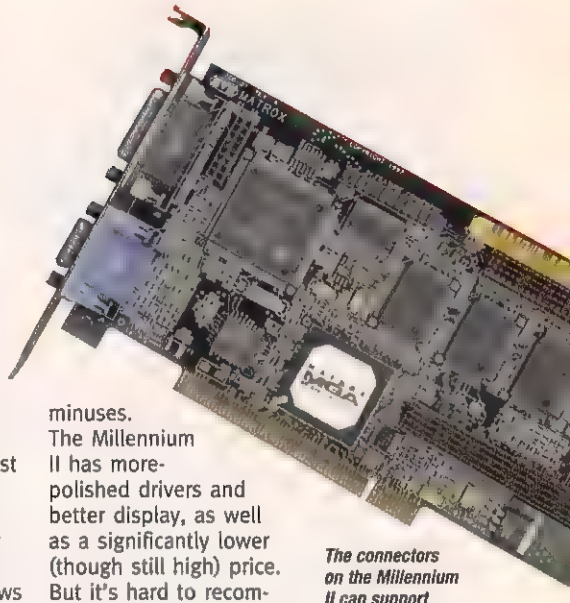
In our other 2D tests, the Revolution consistently outpaced the Millennium II. Either way, the 2D numbers are plenty fast on both.

Scaled MPEG video quality is a mixed bag. The Millennium II looks much better than most, though the Revolution suffers from pixelation and artifacts. Video windows on the Revolution can be scaled to only 1152x870 before deteriorating into a slide show, but the Millennium II can keep cranking video even full screen at 1600x1200. Adding the Rainbow Runner daughterboard (see review in *boot* 12) further enhances by the Millennium's video advantage. This eliminates memory expansion options but provides MJPEG video capture and TV-out.

On the 3D front, the Revolution 3D comes out on top, but on the gaming front neither card holds a candle to 3Dfx-based boards (or to the likes of Fire GL on the OpenGL front). The Millennium II possesses all of the Mystique 220's major 3D shortcomings: no bilinear filtering, no alpha transparency, and butt-ugly stippled fog. The Revolution's Ticket To Ride chip has a full set of features, but current Direct3D drivers refused to allow alpha blending and the seams between textures were often annoyingly visible.

The Revolution 3D board we received for review had 8MB onboard (Matrox provided 4MB), this undoubtedly gave them an advantage in our OpenGL tests, but even so the Revolution 3D is clearly the more muscular of the two cards.

Each card has its pluses and minuses. The Millennium II has more-polished drivers and better display, as well as a significantly lower (though still high) price. But it's hard to recommend a card with such a limited 3D feature set. The Revolution delivers raw speed and better 3D, but it lacks polish and quality video.



The connectors on the Millennium II can support expanded memory or a Rainbow Runner video in/out board, but not both.

Even though both cards fall flat, no other boards address the "prosumer" high-resolution and performance needs without compromising video or gaming 3D. While we are waiting for a true successor in spirit to the Millennium and Imagine 128, we have to wonder whether or not Matrox and Number Nine have enough momentum left to make another try.

—Chris Dunphy

	Millennium II	Revolution 3D
Maximum 24-bit resolution/refresh	1600x1200/70Hz	1280x1024/86Hz (32-bit)
Maximum 16-bit resolution/refresh	1920x1200/70Hz	1920x1080/73Hz
VESA 2.0 Support	Yes	Yes
Virtual Desktop Support	Yes	Yes
MDK PerfTest	79	95
Ziff-Davis 3D Winbench	51.9	111
WinMark 97 10x7x16	84.3 / 39.9	103 / 42.7
WinMark 97 12x10x24	62 / 33.4	71.7 / 37.3
WinMark 97 16x12x16	69 / 34.9	92.1 / 40.2
Quake 320x200	47.3fps	42.4fps
Quake 640x480	15.8fps	12.8fps
Quake 800x600	11fps	9.1fps
TerraMarks (Level 1/2/3)	173 / 174 / failed	200 / 199 / failed
Viewperf under NT 4.0 at 1024x768x16-bit color:		
AWadvs-01	1.30fps	1.76fps
CDRS-03	1.80fps	7.32fps
DRV-04	0.693fps	1.077fps
DX-03	1.37fps	1.878fps
Light-01	0.2138fps	0.2446fps

Business Graphics WinMarks / High-End Graphics WinMarks
Test machine: Micron Millennia Mxe, P200 MMX. Win95 with 32MB, WinNT with 96MB.

Matrox **Millennium II**

***BUNDLE:** Simply 3D 2, Picture Publisher 7, Kai's Power Tools, Compcore softPEG, Netscape Navigator 3.0, Vream WIRL, Colorific*

***Price** $269 (4MB), $369 (8MB)*
***Company** Matrox*
***Phone** 800.844.8302*
***URL** www.matrox.com*

boot verdict 6

Number Nine **Revolution 3D**

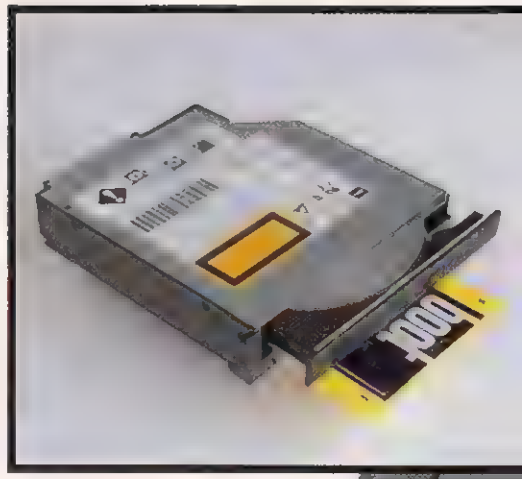
***BUNDLE:** Internet Explorer 3.0, Star Trek: Next Generation Screensaver*

***Price** $349 (4MB), $449 (8MB)*
***Company** Number Nine*
***Phone** 617.674.0009*
***URL** www.nine.com*

boot verdict 7

Gateway 2000 Solo 9100XL

A veritable victory



TWO MINTS IN ONE
Check it out. The 1.44MB floppy *and* 11x CD-ROM are combined in a compact, unit. Very cool.

boot KICK ASS! PRODUCT

The Solo 9100XL is unequivocally the greatest notebook to grace the pages of *boot*. Packing performance power other notebooks can only dream about, the Solo 9100XL is so good you may even forget how heavy it is (almost 8.5 pounds). But what are a few extra pounds between friends?

In this case, the extra weight is all muscle. The list of components in its full-figured feature set is staggering—not to mention the fact that they are incorporated so effectively and efficiently into a notebook. What's more amazing is that the components read like a Who's Who (or a "What's What") for desktop machines: an Intel Pentium 166MHz processor, 64MB(!) of EDO DRAM, a 3GB hard drive, 4MB of onboard video memory, TV-capability, and wavetable sound. It's also the first notebook we've seen that has dual USB ports.

In heavyweight competition, the Solo 9100XL placed first in its class—performance is stellar across the board. In all but two of our extensive tests (AVI playback and SYSmark32), the Solo 9100XL hit the green or executed a TKO. We saw the most notable performances during our DirectX, CPU/Disk, and MMX processing tests: The Solo 9100XL practically jumped off the charts. Even individual components scored well—the 3GB hard drive posted a zippy transfer rate of 2.94MB/sec, and the CD-ROM drive clocked a very respectable 1528K/sec.

Put simply, the Solo 9100XL's performance rocks.

If that isn't enough to whet your appetite, the 9100XL also features a 12-cell lithium-ion which drains power in smaller increments than a regular eight-cell battery (thanks to those four extra cells). It can last upward of three hours on a single charge. If you install the second battery, you'll be able to play *Quake* for more than five hours straight.

Continuing down its path of many firsts, the Solo 9100XL also contains an integrated CD-ROM/floppy drive combo that can be swapped out for the additional battery (included).

The 13.3-inch active-matrix screen may not be the first we've seen (NEC's Versa 6200MX, reviewed in *boot* 08, took home that honor), but it's still a visual treat. The display is crisp and bright, and, surprisingly, the screen exhibits virtually zero flex. Unfortunately, Gateway 2000, just like NEC, hides the inverter on the left side of the screen, resulting in an off-balance display. Another minor gripe: There's no analog brightness control.

If you're tired of mobile products that sacrifice performance and functionality for an anorexic design, you'd be wise to sample the Solo 9100XL. It may be laden with extra calories including USB, wavetable sound, and TV-in and out ports—but man, does it ever taste good.

— Bryan Del Rizzo

under the hood

02:37:00

REAL-WORLD BATTERY LIFE

THE BRAINS	
CPU	Intel Mobile Pentium 166MHz
L2 Cache	256K pipeline burst
RAM	64MB EDO DRAM (192MB maximum)
Video	Chips & Technologies CT65554 (4MB EDO DRAM)
THE BRAWN	
Hard Drive	Varied 3GB
CD-ROM	Teac 11x EIDE/floppy combo
Expansion Bus	Two Type II; one Type III PC card, CardBus and Zoomed Video compatible
I/O Ports	One serial, one monitor, one parallel, game port, TV-in, TV-out, audio-in, audio-out, two USB
Lap Weight	8 pounds, 7.6 ounces
Carrying Weight	10 pounds, 11.8 ounces
THE BEAUTY	
Display	13.3-inch active-matrix screen
Sound	OPL3-SA FM/software-wavetable
Video	1024x768, 24-bit color
Speakers	Stereo
Communication	TelePath 56.6Kbps w/x2 technology or 33.6Kbps w/ cellular capability (software upgradable to 56.6Kbps); IrDA port

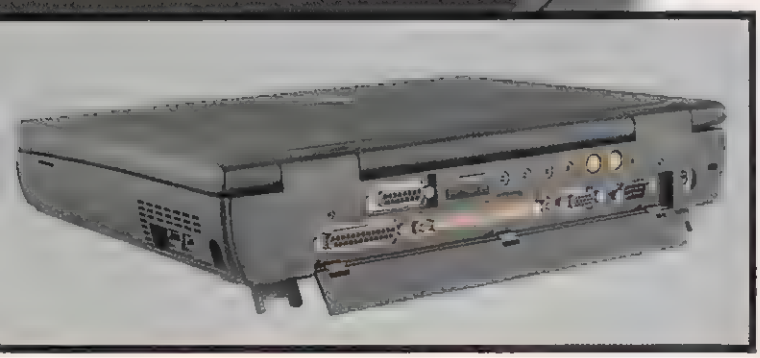
THE BUNDLE Microsoft Office 97 ▮ McAfee Virus Scan95 ▮ LapLink for Windows 95

boot down :33 :08

Except for a higher color depth at 1024x768, there aren't many discernible differences between the integrated Chips & Technologies CT65554 flat-panel accelerator and the older CT65550 model (used by most notebook manufacturers). However, with 4MB of EDO DRAM, video performance was terrific. MPEG playback was quite good, with only minor tearing and pixelation. And although the 35 percent achieved in our for our brutal AVI test seems low, it's quite a feat for a notebook. The extra video memory also comes in handy when using external CRTs.

The Solo 9100XL is one of the first notebooks to feature Intel's new Mobile Module (MMO). The MMO is an integrated module (containing core components such as the processor and PCIset) that plugs into the system's motherboard. The benefit of using MMO is that system manufacturers can easily upgrade the system to take advantage of the latest Intel processors without having to redesign the product.

See if you can find where Gateway 2000 hid the video inverter. Hint: Something's not right.



A DIRTY DOZEN

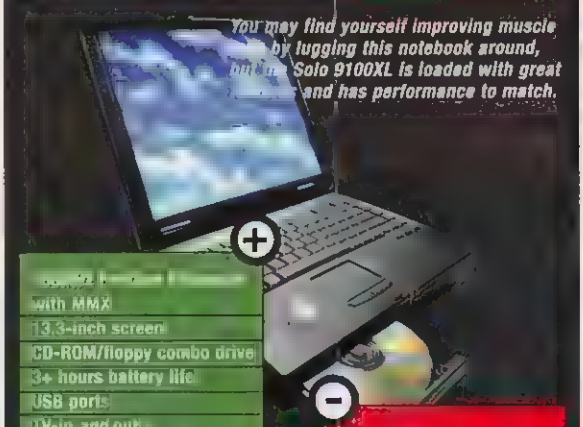
If you're looking for ports, this is the place to be. Is there anything missing? We didn't think so!

real-world benchmarking

Gateway 2000 Solo 9100XL

CPU/MOTHERBOARD	*bootMark*	48.3
WIN95 APPS	*SYSmark32*	125
DIRECT 3D	*Terramark*	composite: no 3D card
HARD DRIVE	*Adaptec ThreadMark v1.0*	MB/sec 2.94
CD-ROM	*CD Tach/Pro v1.65*	K/sec 1528
WIN95 VIDEO	*VidTach v1.52*	% played 34.9
DOS GAMING	*Quake v1.06*	fps 15.0
DIRECTX GAMING	*MDK PerfTest v1.4*	84
MMX PROCESSING	*DeBabelizer Pro*	secs 439
CPU/DISK	*Microsoft Visual C++ compile*	secs 177

You may find yourself improving muscle [illegible] by lugging this notebook around, but the Solo 9100XL is loaded with great [illegible] and has performance to match.



+

- with MMX
- 13.3-inch screen
- CD-ROM/floppy combo drive
- 3+ hours battery life
- USB ports
- TV-in *and* out
- Full-size game port
- 56.6Kbps modem
- Excellent performance

–

- Off-center screen
- No analog brightness control
- Workout weight

Price $5,699
Company Gateway 2000
Phone 800.846.4208
URL www.gateway2000.com

boot verdict **9**

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

SGI O2 R5000SC Workstation

Sexy blue

There's something indescribably appealing about having this cute little box sitting on your desk. Perhaps it has something to do with the smug feeling that having a genuine Silicon Graphics workstation gives, the little brother of the machines that made *Jurassic Park*. Perhaps it's the haughty feeling of superiority you feel in a world of Wintel clones. Or perhaps its just because the O2 helps you get chicks. But whatever the reason you feel you need an O2, your hard earned workstation dollar will likely buy you a lot more bang in the NT world. But its just not nearly as sexy.

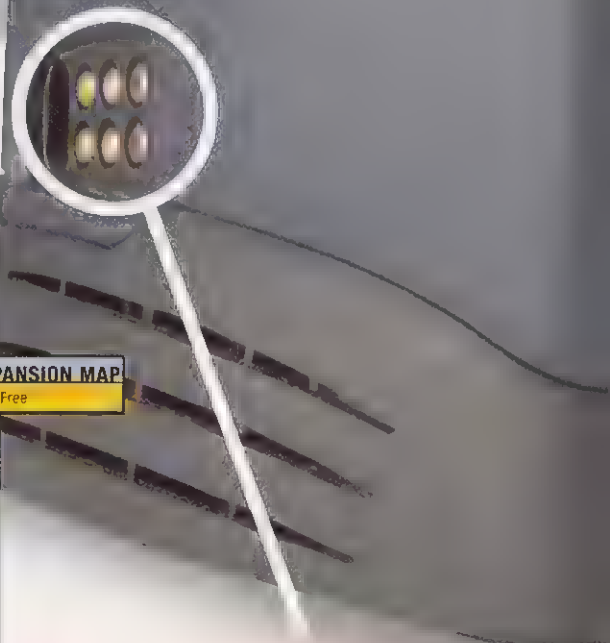
The SGI O2 is a very nice package that comes very nicely packaged. With a flick of your wrist you can slide out the guts of this machine, revealing intelligent design both inside and out. But even though the guts are easily accessible, there is little room for expansion with only one free drive bay and, inexcusably, only one PCI slot. Fortunately the O2 comes with a lot built in. The video-in/-out features are unsurpassed, and further enhanced by the included high-quality digital camera for mounting on top of the marbled-looking, visually superb 17-inch monitor. The 4GB HD is a little tight for space with the mammoth Irix 6.3 OS and massive bundle of optional components gobbling up nearly half of it, but many of these can be uninstalled. The OpenGL-optimized 3D-accelerated graphics subsystem is fast and versatile, and deals well with large, complex models. It plays a mean game of *GLQuake* too, though the visual quality and speed do lag behind the 3Dfx.

The base model O2 is reasonably priced, as far as Unix workstations go, but it's still darn pricey for what you get, compared to PC land. Software is much harder to come by and tends to be more expensive as well. But if you have the bucks and can live without games and Windows compatibility—and you really want the sexiest looking machine on the block—nothing can hold a candle to the SGI O2.

— Chris Dunphy

The O2 does not have any video memory. Or rather, it does not have any memory that is not video memory. Thanks to its Universal Memory Architecture, the O2's RAM can be divided as needed between the graphics engine, CPU, decompression engine, and whatever else needs it. With 2.1GBs of memory bandwidth and an interleaved design that allows multiple memory banks to be active at any one time, each subsystem never sweats for access to data despite being forced to share. An obvious benefit of this design is the ability to devote a 100MB of memory towards textures if your 3D app so desires, but another nice side effect is that the CPU has simultaneous access to all these textures, and can be modifying them in real time for some advanced effects. This allows the O2 to work some pretty impressive magic, such as taking live input from the digital camera, distorting it, and displaying it onto a rotating 3D object. Dam cool.

BACKSIDE BONANZA



I/O, I/O, IT'S OFF TO WORK WE GO

S-video, composite, and RCA audio-in and -out jacks are built into the side of the case, easily accessible no matter what angle you approach from. Headphone and microphone jacks round out this media dream port.

under the hood

THE BRAINS

CPU	MIPS R5000K, 180MHz; 64K L1 Cache
L2 Cache	512K
RAM	192MB SDRAM (1GB maximum)

THE BRAWN

Hard Drive	IBM 4GB
CD-ROM	4x Tosh ba XM-5401B
Expansion Bus	One PCI slot
I/O Ports	SCSI-3 Fast/Wide, Parallel (IEE 1284-C), 2 Serial; Mouse, Keyboard, Audio, Video

THE BEAUTY

Display	SGI GDM-17E21 (1280x1024)
Sound	Built-in SGI Proprietary
Video	Built-in SGI Proprietary
Communication	10/100 Ethernet

EXPANSION MAP

PCI	Free

THE BUNDLE Irix 6.3 | Netscape Gold 3.0 | Netscape FastTrack Server | Insignia SoftWindows95 | Adobe Photoshop | Adobe Illustrator | Kai's PowerGoo

boot down 2:35 :21

LITTLE, BLUE, DIFFERENT

The rounded blue case is the cutest thing to sit on a desk since the original all-in-one Macintosh. You certainly won't find your machine blending in with the Wintel crowd; but you will also be hard pressed to get your O2 to share in the plethora of cheap Wintel hardware and software. Bummer.

DIMM THE LIGHTS

The O2 supports up to eight DIMMS stocked with fast 66MHz SDRAM memory. The memory is interleaved, allowing even more speedup due to two banks of memory being active at a time. Thanks to the UMA architecture, all the memory is shared and equally accessible by the CPU and the graphics subsystem.

ND AND

Volume buttons are b onto the front of the as is a surprisingly nice sounding internal speaker But if you want stereo, you must provide your own external pair.

SPILL YER GUTS

Never before has a machine come apart so easily. Even the power supply slides out—without a single screw—for easy replacement. Only the CD-ROM is locked within the case, but even it is easier to get at than on most PCs.

SGI O2 R5000SC

real-world benchmarking

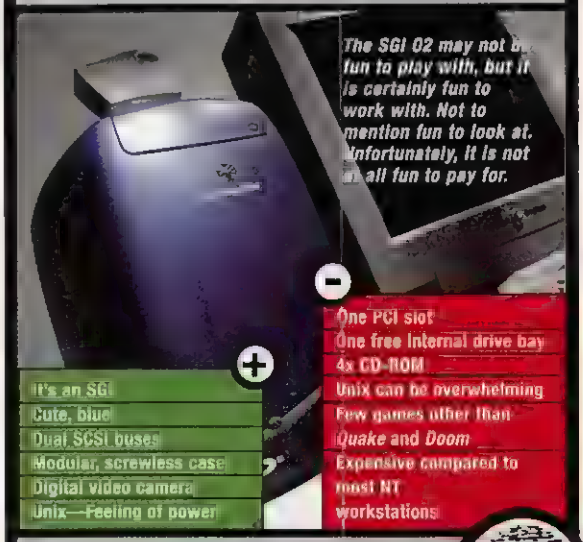
VIEWPERF

	fps
cdrs-03	13.89
drv-04	2.16
dx-03	2.73
AWadvs-0	5.07
light-01	0.46

GLQUAKE

	fps
640x480	20.90
800x600	17.00
1024x768	12.40
1280x1024	8.10

The O2's operating system of choice is Irix; SGI's flavor of Unix coupled with a snazzy graphic environment and lots of tools to make taming Unix easier. If you've grown up living in a Windows world, life with Unix can at first seem overwhelming; but once you've grasped the fundamentals, the power and flexibility are unsurpassed. The price of commercial Unix applications is also unsurpassed, even if they are just ports of the Windows versions. Fortunately there is a wealth of free software available on the Internet to make your O2 do whatever you want it to.



The SGI O2 may not b fun to play with, but it is certainly fun to work with. Not to mention fun to look at. Unfortunately, it is not all fun to pay for.

+

- It's an SGI
- Cute, blue
- Dual SCSI buses
- Modular, screwless case
- Digital video camera
- Unix—Feeling of power

−

- One PCI slot
- One free internal drive bay
- 4x CD-ROM
- Unix can be overwhelming
- Few games other than *Quake* and *Doom*
- Expensive compared to most NT workstations

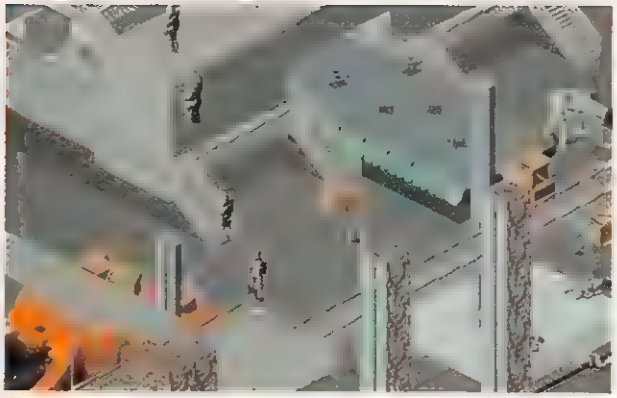
Price *$12,299 as tested, cheapest configuration: $5,995*
Company *Silicon Graphics*
Phone *800.800.7441*
URL *www.sgi.com*

boot verdict **6**

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

X-Com **Apocalypse**

Not just another bug hunt



The VGA graphics of X-Com: Apocalypse *have failed to keep pace with the competitor's comparable offerings.*

MicroProse has launched its next installment in the *X-Com* series: *Apocalypse*. The original *X-Com* was truly an original, albeit with a stench of raid in the air. *Apocalypse*, the sequel, is more of the same.

CHECKLIST

Maximum Resolution/Color
640x480/256-bit
Win95 Native
DirectX
DirectDraw DirectSound

As opposed to fighting for the safety of an entire planet, this installment limits your X-ploits to a single city. In the city there are more than 50 types of buildings that can be bought to expand your troops and research facilities. Funding comes from large businesses, and the more successful you are, the higher the profits. The bad news is that aliens can also invade buildings (don't let the aliens capture the hospitals, schools, or bases). Research into new weapons and resource management lies at the heart of this game, because without the big gun, you're not going to make it. This is a tough challenge for even the most advanced gamers.

X-Com Apocalypse has added some new features to the *X-Com* legacy: the addition of a real-time combat engine (along with the standard turn-based system), and a drag-and-drop system allowing you to deploy equipment, vehicles, and troops anywhere in the city limits.

Combat missions are randomly designed. A few can be completed within a few minutes, while others require hours of relentless searching for the final objective—either a simple capture scenario or a "kill all the aliens to complete the mission" chore. The combat graphics are weak. The lowly resolution of explosions and gun play could have been, and should have been, so much more than just SVGA.

X-Com Apocalypse provides a whole new set of nasty aliens to fight, and it'll take a lot of energy and determination to complete the game from start to finish. This version of the AI is smarter and tougher to play. This is a much better game than *X-Com Terror From the Deep*.

—Tommy Maple

Price *$49.95*
Developer *Microprose UK*
Publisher *Microprose*
Phone *800.695.4263*
URL *www.microprose.com*

Betrayal In Antara

Goin' to crash a party

Sierra's *Betrayal In Antara* is one cross-country trip you'd best not take. In this three-CD role-playing epic, you and your merry band of adventurers enter the Antaran Empire, and clash with hordes of scaly beasts and uncouth men in search of the ever-valuable experience point.

Betrayal in Antara *traps you in an unreal world of stiff mannequins and an equally rigid interface.*

Antara's action should be familiar to *Betrayal At Krondor* fans. It's a first-person jaunt over the river and through the woods—this time in 640x480 SVGA—while melees are handled via a third-person, turn-based combat system. Despite the higher resolution, the multitude of sprites that scar the landscape as trees, flora, and people are sadly pixelated, though not as badly as in *Blood*. The texture-mapped, ray-cast world moves at a brisk pace, but never quite enters the "smooth-as-buttah" 30+ fps range. Thankfully, menus pop up whenever your cursor ventures to the bottom of the screen. Visual effects are few and far between. Nightfall slowly descends in a black, banded shading effect.

Combat, unfortunately, looks worse than the pixelated trees, with characters moonwalking their way into position, employing very few

CHECKLIST

Maximum Resolution/Color
640x480/256-bit
Win95 Native
DirectX
DirectDraw DirectSound

frames of animation. Even magic spells and attacks look lame. When you encounter friendly NPCs, don't expect cool conversation animation—the NPCs never change facial expressions, even when making the jump from happy to mad. Thankfully, the music and sound effects work well here, as does all the digitized speech liberally sprinkled throughout this weak game.

The adventure, like Krondor, is broken down into chapters, so while you're free to wander the countryside and cityscapes, you're ultimately led down a linear path where a specific event signals the end of a specific chapter. Don't expect the far-reaching epic exploration that *Daggerfall* slammed you with.

— Andrew Sanchez

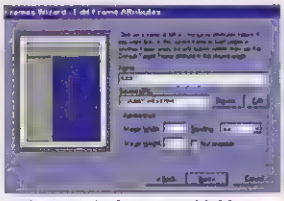
Price *$45*
Developer/Publisher *Sierra On Line*
Phone *800.757.7707*
URL *www.sierra.com*

HTML **Editors**

State-of-the-art web creation

If your HTML editor doesn't do wizard-driven site and page construction, hyperlink maintenance, automated uploading to your server, and total WYSIWYG editing all for around $100, you're missing out. Of course, you can't get everything you want in a single package; supercool features such as drag-resizable frames and tables are missing from the high-end tools, and more modest programs do little to assist with the daunting task of maintaining a site of any significant size. Still, the latest revs of FrontPage *and* PageMill *have come a long way toward making it possible to manage a site without HTML knowledge.*

— Neil Redding



Unfortunately, frames and tables can't be edited directly in* FrontPage *97; you have to use a wizard or configuration dialog, and it's difficult to tell exactly what you'll get.

PageMill 2.0 is all about direct manipulation; a minute or two of drag-and-drop gave us these frames, the table, and the resized images within the table's cells—not to mention the snazzy background colors.

Microsoft **FrontPage** 97

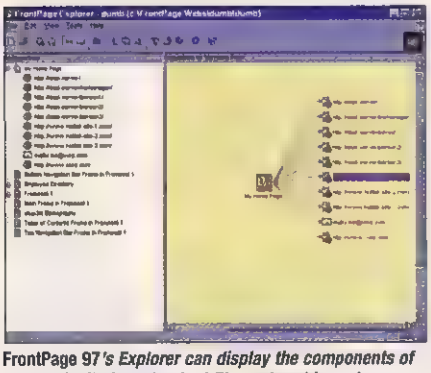
FrontPage is largely responsible for heightening our expectations of HTML editors. If you're anxious to create a new web site, and especially if you're already comfortable with the *Office* suite of tools, it's hard to pass up a package this complete.

Check this out: *FrontPage* will take you from zero to a useable site in less than 15 minutes. First, pick the type of site that's closest to what you want from the site-construction wizard, fill in a few blanks and you'll be looking at *FrontPage* Explorer's display of the various newly-created pages comprising your site. Filling in the blanks in your pages is equally easy, since *FrontPage*'s Editor looks and works like Microsoft *Word*. The one big omission is support for direct-manipulation frame and table editing; for these you have to run non-WYSIWYG wizards, which just aren't as much fun. WYSIWYG editors make it hellish to maintain their sites with a text editor by bloating files with a host of excess and arcane tags.

FrontPage also checks for and corrects broken links, can generate a full table of contents for your site, and comes with a personal web server, capable of supporting a small intranet with reasonable performance. Maintaining your stuff on a remote server is handled transparently, and the included syntax-colored editor makes tweaking HTML source less painful. WebBots make adding Java applets, ActiveX controls, CGI's and the like all simple tasks as well.

Need a kicker? *Office* users get a $40 rebate, making *FrontPage 97* as affordable as the cheapest of HTML editors. Unless you're already married to your current site-management method, get *FrontPage 97*.

Price $149
Developer/Publisher
Microsoft
Phone 800.426.9200
URL www.microsoft.com

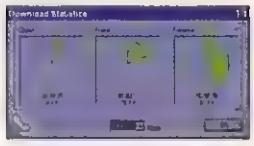


FrontPage 97's Explorer can display the components of your web site in a standard file-system-hierarchy manner, but its ability to show you what's hyperlinked to what is the real killer feature—and it manages all those links as easily as it displays them.

Adobe **PageMill** 2.0

PageMill 2.0 is the easiest HTML editor we've seen for constructing pages with frames and tables, two of the biggest and most common annoyances in the world of web authoring. Sizing frames is as easy in *PageMill* as it is in a web browser, just drag a slider. The same goes for table-cell editing. And almost anything you can drag can be dropped almost anywhere; an image from the desktop can be dropped into a table cell, and a Java applet's class file can be dropped in the middle of a sentence, making the text flow around the applet. All the other standard stuff, such as formatting text, setting colors, and setting up links is equally straightforward. You'd expect this kind of simplicity from a publishing-oriented developer like Adobe, and it makes authoring a joy.

Naturally, there's support for uploading your content to the server of your choice, and estimated download times for your pages are also provided. There's a large library of clipart, Java applets, and ShockWave animations included, as well as a limited edition of Adobe's *Photoshop*, which does the job for basic image editing.



PageMill 2.0 is good at estimating download time at various bandwidths—you'll be thanking Adobe for this one.

The single-level undo limitation is almost inexcusable these days, and there's no site-management support to speak of, but *PageMill 2.0* still delivers important features that no other tool does. We figure you'll want it in your bag of tricks, no matter how you weave your web site.

Price $99
Developer/Publisher
Adobe Systems
Phone 800.411.8657
URL www.adobe.com

Diamond **Fire** GL 1000

As open as you wanna be

Diamond's Fire GL 1000's PCI-based card comes strapped with 4MB of SGRAM upgradable to 8MB (tested here), as well as a 220MHz IBM 24-bit RAMDAC.

The heart and soul of the Fire GL 1000 is the Permedia NT chipset, combining 3Dlab's Glint Delta hardware setup engine and the Permedia display adapter in one, cost-effective chip. The Glint Delta is a 64-bit, 100 Mflops geometry pipeline processor that performs setup and slope in precision floating point for compatible rendering APIs including OpenGL, Direct3D, Kinetix's Heidi, and Apple's QuickDraw 3D. The Permedia takes care of video playback, SVGA display, and Windows acceleration. The combined system pushes 600k texture-mapped, bilinear filtered, perspective-corrected polygons per second, and claims upward of 30 million pixels per second fill rate.

Installation is a snap, with Diamond's friendly *InControl Tools 95* serving your tweaking needs, including Direct3D and OpenGL settings, refresh rates, and more. *V-Realm Builder* and *Extreme 3D* are also bundled with the card.

System: Intel Pentium P200 MMX w/32MB EDO-DRAM
Resolution: 1024x768/64k colors @ 75Hz

Benchmark Diamond Fire GL 1000	
MDK PerfTest v1.4	88
Quake 320x200	45.3fps
Quake 640x480	9.1fps (UniVBE required)
GLQuake 640x480	7.8fps (No wall textures)
Terramark L1/L2/L3/Total	185/163/165/513
Terracide Performance	19fps to 30fps
Business WinMark	73.2
High-End WinMark	25.2

This card is designed with 3D rendering in mind, not *GLQuake*.

Under NT4.0, the Fire GL 1000 cruised through Viewperf, scoring impressive total composite frame rates. Overall true-color performance puts the Fire GL 1000 within striking range of more expensive OpenGL cards from Intergraph, and even into the realm of SGI's O2 R5000/180MHz machine. Viewperf scores place the Fire GL 1000 in a field with the Intense3D 1000 and ELSA GLoria-L based cards. Considering the low price for this 8MB card, the Fire GL 1000 is ready to rumble with the best.

Viewperf benchmarks are one of the hallmark tests to see how many polygons an OpenGL-compliant card can push. For our tests, we used a Pentium II 233MHz processor with 80MB of RAM, and Viewperf 5.0. Windows NT 4.0 (Build 1381) performed OS duties. Tekram's P6F40K-A5 motherboard provided the backbone.

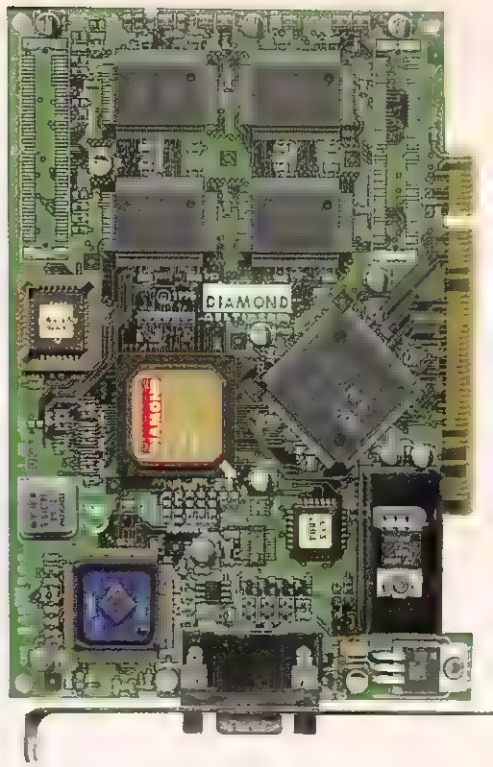
Tests were conducted at 1024x768/16 million colors @ 75Hz refresh rate.

Geometric Mean Composite Viewperf Score (fps)

Benchmark	Fire GL 1000	ELSA GLoria-L*	SGI O2 R5000/180*
AWadvs	5.07	3.24	5.37
CDRS	15.35	24.73	15.78
Drv	2.13	1.99	2.26
Dx	3.41	4.70	2.88
Light	0.63	0.57	0.47

** Scores obtained from Specbench/OPC web site. www.specbench.org/gpc/opc.static/*

Don't expect bone-crushing DOS performance or VESA 2.0 compatibility from the Permedia NT chipset—it requires *Display Doctor* or a comparable TSR. Performance under DOS proved limp, with *Quake* struggling along at a paltry 9.1fps in 640x480 SVGA. *GLQuake* is a frightening experience, with walls dropping textures and frame rates locking in at an even slower 7.8fps at 640x480. DirectX performance is also below expectations, scoring an 88 on the *MDK* PerfTest. However, Direct3D performance is average, scoring 513 total Terramarks, with *Terracide*'s frame rates ranging between 19fps to 30fps. The Fire GL 1000's bilinear filtering, while better than the Cirrus Logic Laguna 3D's tawdry upsampled attempt, still suffers from stray filter artifacting.



Powered by the Permedia NT chipset, the Diamond Fire GL 1000's OpenGL performance rivals cards twice the price.

Fire GL 1000
Max 32-bit Resolution/Refresh
1280x1024/75Hz
Max 16-bit Resolution/Refresh
1600x1200/75Hz
BIOS: Diamond v1.21
Win95 Driver: v 0397
OpenGL Driver: v0397/1.1.15b
VESA 2.0 Support: No

Video playback, whether AVI or MPEG, is uneven, with digital video exhibiting pixelation. Windows 2D performance is strong, but not outstanding.

As an all-in-one solution, don't chuck your ATI/3Dfx combo just yet, but for a truly cost-effective OpenGL solution, the Fire GL 1000 gives you some hearty performance at a fraction of what other video-card pushers will gank you for.

— Andrew Sanchez

Price $299 (8MB version), $269 (4MB version)
Company Diamond Multimedia
Phone 800.380.0030
URL www.diamondmm.com

boot verdict 7

3Dlabs' is putting the final touches on the Permedia 2 graphics processor, which packs 2D and 3D acceleration alongside MPEG-2 video playback.

A full floating-point geometry setup processor accelerates texture normalization and floating-point edge slope calculations, enabling vertex sharing as well as performing floating-point to fixed-point data conversions. This "full setup" engine reduces both CPU load and backplane bandwidth by up to 70 percent, enabling a true 1 million polygons per second performance with reduced CPU loading.

Permedia 2 will add a faster 230MHz RAMDAC and an enhanced graphics engine, and it will come in both PCI and AGP flavors. The maximum RAMDAC frequency of 230MHz allows display resolutions up to 1600x1200 at 83Hz.

Rounding out this package are advanced video handling capabilities, including MPEG-2 acceleration and a dedicated DMA engine.

The input interface can support an external TV tuner or provide complete DVD decoding acceleration in hardware. The output interface can drive an external high-quality TV encoder, for TV-out capability that can be controlled independently from the primary display.

Super **Mario** Andretti

Two F1 racing sims vie for the checkered flag

These new Formula One racing sims reconstruct real-life Grand Prix circuits for intense rubber-burning-across-asphalt experiences.

— Scott May

Formula 1 *red lines 3D accelerators with up to 9,000 polygons per frame at 30fps.*

Formula 1

Released to wide critical acclaim on the PlayStation, the PC version of *Formula 1* is turbo-charged by 3D acceleration.

Formula 1 offers authentic Grand Prix action in two modes: arcade or simulation. Officially licensed by FOCA/FIA, the game features all 13 Constructor teams and 35 drivers from the 1995 racing season. Seventeen tracks are included, each painstakingly modeled from real-life circuits such as Silverstone, Monaco, and Adelaide. Practice, single race, and full championship season play are offered. At the time of this writing, only single- and two-player split-screen modes are available, with Psygnosis promising a multiplayer modem and network patch.

To achieve its eye-popping 640x480 resolution and 64k color depth, *Formula 1* requires one of the following 3D chipsets: Matrox Mystique (4MB version), 3D Lab Permedia, Rendition Vérité, 3Dfx Voodoo, or Voodoo Rush. This extra hardware muscle dramatically improves image quality, using techniques such as perspective correction, filtered textures, Gouraud shading, fogging, reflections, and transparency effects.

Although Psygnosis lists a P-90 with 16MB RAM as the minimum system requirement, you'll need at least a P-133 to max out at 30fps. The game features all-polygonal graphics rendered in real time at up to 9,000 polygons per frame, or a head-spinning 270,000 polygons per second at 30fps. Sound is equally important, featuring more than one hour of context-sensitive audio commentary by Murray Walker, and the screaming guitars of Joe Satriani and Steve Vai.

Control options include keyboard, mouse, digital/analog joysticks, and steering wheels. The action on the tarmac is extremely realistic, especially in simulation mode, where weather effects, collision damage, and well-timed pit stops require more strategy than typical lead-foot arcade racing.

Unfortunately eyesores such as terrain pop-up and ugly clipping problems during collisions keep the game on the near side of perfection.

CHECKLIST

Maximum Resolution/Color
640x480/16-bit
Win95 Native
3D Software Acceleration
Direct3D
3D Hardware Acceleration
Rendition 3Dfx Matrox
DirectX
DirectDraw DirectSound DirectInput

Price *$55*
Developer *Bizarre Creations*
Publisher *Psygnosis*
Phone *800.438.7794*
URL *www.psygnosis.com*

boot verdict 7

Power F1

TRY IT ON THE DISC

Kudos to Eidos for being up-front about its intentions with *Power F1*, a Grand Prix racing game where reality takes a back seat to pure arcade thrills.

Officially licensed by FIA, the game offers all 17 Formula One tracks, teams, and drivers from the 1995 season. Game modes include practice, single race, shoot-out, and championship seasons, each with three skill settings.

Designed for DOS (with a Win95 version in the works) *Power F1* doesn't use MMX or 3D hardware support. The game features a proprietary multi-sided polygon engine, rendered in real time, with your choice of low- (VGA) or high-res (SVGA) displays. Although the vehicles incorporate a lower polygon count (about 100) than competitors such as *Formula 1*, good use of Gouraud shading, real-time light sourcing, and hand-drawn texture maps enhance the display.

Power F1 uses split-screen mode for head-to-head racing, with only slight degradation of graphic detail.

The upside to *Power F1*'s slightly decreased visual acuity is increased performance on low-end systems. Frame rates are a little choppy on a 486/66 (its minimum requirement), but smooth out on a 486/133, and absolutely smoke on a P-90. Driver control—supporting either keyboard, joystick, or steering wheel—is also incredibly tight and responsive.

The illusion of speed is excellent, shattered only by low key-frame animation—710fps to 20fps on the average PC. Your F1 racer appears detached from the track, floating into turns with no visible movement of the front tires. This alone relegates *Power F1* to the arcade camp. Taken as such, gameplay can still be a blast, particularly in multiplayer mode. Sounds are limited to on-track engine sounds, collisions, and tire squeals, with no race commentary.

Power F1 delivers instant racing gratification for the arcade crowd. Sim purists, however, should stick with Psygnosis' *Formula 1* or MicroProse's *Grand Prix II*.

CHECKLIST

Maximum Resolution/Color
640x480/8-bit
MS-DOS
Multiplayer
LAN Split-screen

Price *$50*
Developer *Teque London*
Publisher *Eidos Interactive*
Phone *800.616.2022*
URL *www.eidos.com*

boot verdict 6

Toshiba **Libretto** 50CT

Smaller isn't necessarily better

The Libretto is undeniably the cutest little notebook to grace the bootLab, but after taking this baby for a two-week spin, I'm ready to trade up to a bigger model.

Slightly bigger than a paperback book and with a base weight just under two pounds, the Libretto is in a new product category: the mini-notebook. It packs a 75MHz Pentium, 772MB hard drive, 6.1-inch color TFT display, a mono-speaker, and wavetable sound. Toshiba gets credit for stuffing a notebook into such a diminutive design, but its sacrifices counter the effort.

The Libretto's Intel Pentium 75 processor is geared toward word processing, e-mail, and light business applications—certainly not games, video playback, or any apps relying on processor muscle. Toshiba isn't positioning the Libretto as a standalone mobile solution, so harping on the shortcomings of a P75 in the age of 300MHz Pentium IIs is unfair. Check the benchmarks below to see exactly what level of performance to expect. Our advice? Keep your expectations low, and don't even think about attempting MPEG or AVI playback. (And stay away from *Quake*.)

The biggest problem with the Libretto is its lack of connectivity. There's no internal floppy drive, there's no internal CD-ROM drive, and there's only one PC Card slot. An external floppy drive is included, but it requires the lone PC Card slot. To use a CD-ROM drive, modem, or any other type of PC Card device, you'll have to continually switch back and forth. What a pain. To make matters worse, installing new PC Card devices is a nightmare.

For example, when attempting to install a modem, Win95 automatically detected the new card, but required the installation of drivers contained on a CD-ROM. Unfortunately, the CD-ROM drivers are on floppy disk. Just plug in the floppy and install the CD-ROM drivers, uh oh... no CD-ROM drive detected. Pull out floppy, plug in CD-ROM. Install modem drivers. No modem detected... you get the idea.

Also, the CD-ROM drive and modem *aren't* included. We had to borrow a Traveler 820 8X Portable CD-ROM Player from EXP Computer for this review. You could try the IrDA port to install files, but we'd shudder to think of the ensuing consequences.

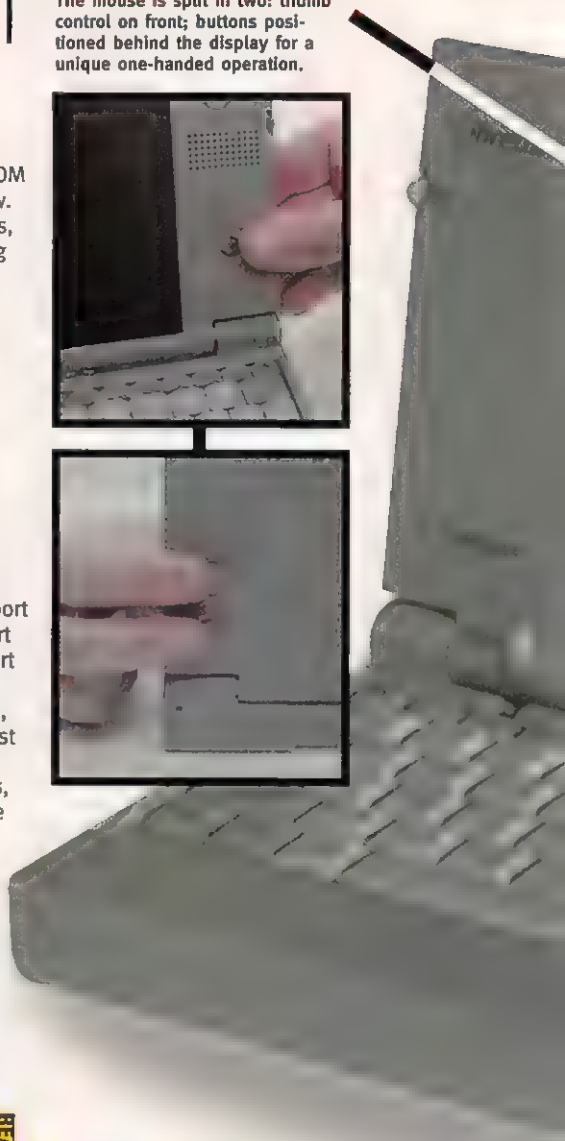
The miniature 15mm-size keyboard is impossible for humans to use—unless you're a one-finger typist and that one finger is your pinky. The inclusion of a Windows key would have cut mouse navigation by half. The mouse—with a tiny thumb pad on the front and two buttons on the back of the display—seems intuitive, but precise navigation is difficult, due to severe drift.

The mini port-expander seems like a good idea, too, but unless you want to fork out another $179 for an *enhanced* port replicator, which includes a keyboard port and Type III PC Card slot, a keyboard port is nowhere to be found. Toshiba would have been wise to include a floppy drive, CD-ROM drive, keyboard port, and at least two PC Card slots (for a permanent network connection). Without those features, there's no compelling reason to keep the Libretto around.

It may have a certain "awe" factor, but the appeal of the Libretto is severely limited. With a price of more than $1,000 per pound, you're better off picking up a Pilot. You'll save yourself about $1,600 and have more fun (and a lot less frustration) in the process.

— Bryan Del Rizzo

MOUSE IN THE HOUSE
The mouse is split in two: thumb control on front; buttons positioned behind the display for a unique one-handed operation.



under the hood

00:37:00

REAL-WORLD BATTERY LIFE

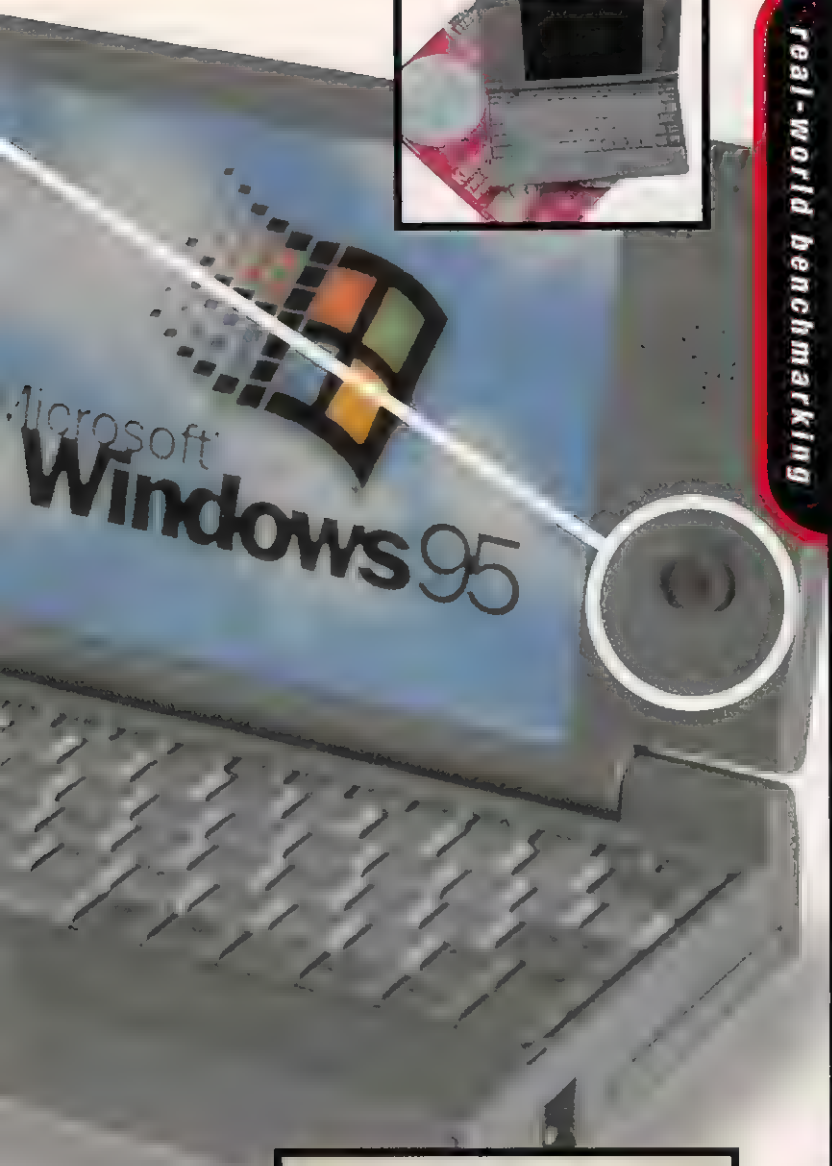
THE BRAINS	
CPU	Intel Pentium 75MHz
L2 Cache	16K internal
RAM	16MB EDO DRAM (32MB maximum)
Motherboard	Chips & Technologies CT65550, 1MB EDO DRAM
THE BRAWN	
Hard Drive	772MB
CD-ROM	Not included
Expansion Bus	One Type II PC Card
I/O Ports	One serial, one monitor, one parallel (on port expander)
Lap Weight	1 pound, 13.8 ounces
Carrying Weight	4 pounds, 12.9 ounces (with port expander, AC adapter, floppy drive, CD-ROM drive)
THE BEAUTY	
Display	6.1-inch color TFT
Sound	OPL3-SA FM/SoftSynth
Video	640x480, 24-bit color
Speakers	Right only
Communication	IrDA port
THE BUNDLE	Various utilities and online documentation only

boot :59 down :34

SOMETHING WICKED THIS WAY COMES
The tiny port expander secures to the Libretto with two easy-locking screws. But without a keyboard connection, there's not much reason to hook it up.

THE FOURTH DIMENSION

Talk about small potatoes. The Libretto measures only 8¼ inches wide by 4½ inches deep by 1¼ inches high, and weighs less than two pounds.



GAINING WEIGHT

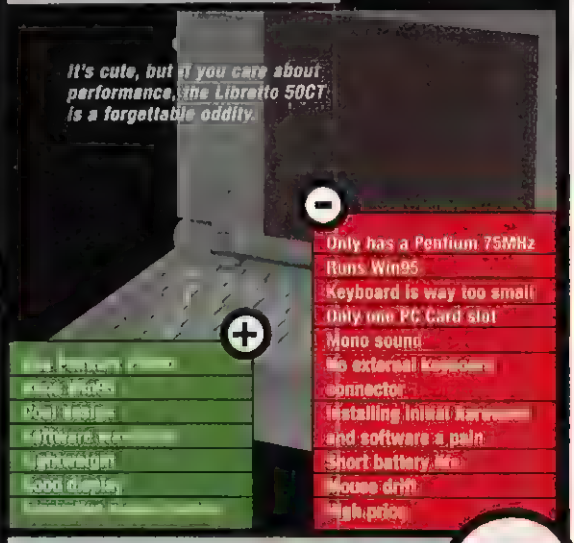
Once you factor in all the components you're forced to carry with you, you may as well purchase a real subnotebook (such as Micron's TransPort VIx). All this gear adds a pound or two of weight.

Toshiba Libretto 50CT

real-world benchmarking

CPU/MOTHERBOARD *bootMark*	14.4	
WIN95 APPS *SYSmark32*		would not run
DIRECT 3D *Terramark*	composite	no 3D card
HARD DRIVE *Adaptec ThreadMark v1.0*	MB/sec 1.94	
CD-ROM *CD Tach/Pro v1.65*	K/sec 861	Note: CD-ROM drive not included. CD-ROM courtesy of EXP Computer.
WIN95 VIDEO *VidTach v1.52*	% played	would not run
DOS GAMING *Quake v1.06*	fps 5.6	
DIRECTX GAMING *MDK PerfTest v1.4*	29	
MMX PROCESSING *DeBabelizer Pro*	secs (1810)	not applicable
CPU/DISK *Microsoft Visual C++ compile*	secs 969	

It's cute, but if you care about performance, the Libretto 50CT is a forgettable oddity.



- Only has a Pentium 75MHz
- Runs Win95
- Keyboard is way too small
- Only one PC Card slot
- Mono sound
- No external keyboard connector
- Installing initial hardware and software a pain
- Short battery life
- Mouse drift
- High price

Price $1,999
Company Toshiba Computer Systems
Phone 800.457.7777
URL www.computers/toshiba.com

boot verdict 4

A complete breakdown of benchmark results is available on the *bootNet*. Point your browser to www.bootnet.com

Exabyte **Eagle** Nest

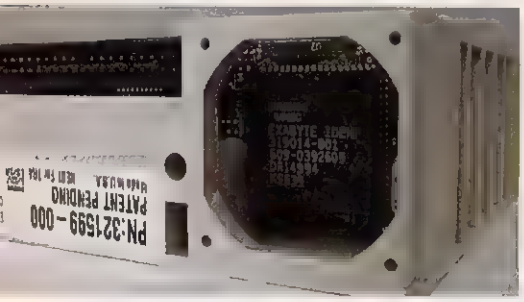
A swinger's delight

Exabyte's Eagle Nest makes hot-swapping—the desktop peripheral's Holy Grail—a reality, but not without a tribulation or two along the way.

A universal nest allows the Eagle Nest system to swap out different drives and devices. The startup system consists of a single storage device packaged with a plastic EIDE drive nest that mounts in a 5.25-inch drive bay. An Acculogic 16-bit ISA EIDE controller card, with IDE ribbon cable and power cables, satisfies interfacing needs. But don't abandon that paltry ISA card—it's required. The Eagle Nest won't install correctly in your existing EIDE channel. We did get a motherboard's secondary EIDE channel to work by installing and then yanking out the ISA card, and connecting to the onboard EIDE cable. Your results may vary.

Triple-check your settings before installing the Nest. You'll need a free address and IRQ for the additional IDE card. Also, make sure you leave the interface set as a slave device.

The Zip drive and TR-4i tape back-up live in almost perfect harmony—dig those handles!



The secret of hot-swapping revealed: the custom ASIC chip and some device-driver trickery provide the power.

Once installed, choose from a variety of modified storage options sold separately, including an Iomega Zip drive, SuperDisk drive, TR-4i tape backup, and, coming soon, a 1.4GB hard drive! These can be hot-swapped to suit your needs.

The Eagle Nest achieves its hot-swapping power with a combination of device drivers and its own ASIC chip, which fools Windows into thinking it's a basic removable disk. Turning the switch and yanking the drive makes the ASIC take over and keep Win95 at bay. The drive letter disappears, but shove in the new device and it will reappear after about 10 seconds as a removable device.

The Eagle Nest works flawlessly. Moving from a Zip drive to SuperDisk is a hot-swap away, and more devices are on the way, such as Exabyte's Eagle DMi tape drive (previewed in *boot* 09).

Three things ground the Eagle Nest: no support beyond Win95, the inability to use your own EIDE channel, and the flimsy universal nest. The use of an extra EIDE card is the strongest strike—with systems already hard up for IRQs. You can't set up the Eagle Nest as a boot device either, so ditching your 3.5-inch floppy for the SuperDisk devices is a moot point. Making the Eagle Nest hard drive your bootable removable drive would be an excellent security system.

We hope these issues will be addressed in the next version, because the Exabyte Eagle Nest is a cool concept that sorely needs tweaking.

— Andrew Sanchez

The bare-bones Eagle Nest installs in a 5.25-inch drive bay.

Pull out the tape drive and slap in a hard drive—it's all good!

Price *Internal IDE Nest $60; Nest-ready Iomega Zip drive $149; Nest-ready SuperDisk $149; Nest-ready TR-4i $329; Nest-ready 1.4GB hard drive $375*
Company *Exabyte*
Phone *800.392.2983*
URL *www.exabyte.com*

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Notebook Computer Selection Guide

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Acer	TI Extensa	610CD	P150	1.4GB	16MB	10X	6.4lbs	11.3" SVGA DS	44942	$1899.00
Acer	TI Extensa	660CD	P166 MMX	1.35GB	16MB	10X	7.0lbs	12.1" SVGA DS	45218	$2669.00
Acer	TI TravelMate	7060	P166 MMX	2.0GB	32MB	10X	7.0lbs	12.1" SVGA TFT	44940	$4449.00
AMS Tech	TravelPro	105CS	P150	1.3GB	16MB	10X	6.1lbs	12.1" SVGA DS	47337	$1999.00
AMS Tech	TravelPro	188CT	P166 MMX	2.1GB	16MB	12X	6.1lbs	12.1" SVGA TFT	47338	$2999.00
AMS Tech	TravelPro	2010CX	P166 MMX	2.1GB	32MB	10X	7.0lbs	13.3" XGA TFT	42987	$4499.00
AMS Tech	TravelPro	2020CX	P200 MMX	2.1GB	32MB	10X	7.0lbs	13.3" XGA TFT	47339	$4799.00
AST	Ascentia	A60+	P150	1.0GB	16MB	–	7.0lbs	12.1" SVGA DS	42438	$2749.00
AST	Ascentia	P 70	P150 MMX	3.1GB	32MB	10X	7.1lbs	12.1" SVGA TFT	42413	$3999.00
Compaq	Armada	1510DM	P120	1.0GB	16MB	10X	7.4lbs	11.3" SVGA DS	47304	$1849.00
Compaq	Armada	1520DM	P133	1.0GB	16MB	10X	7.4lbs	11.3" SVGA DS	47305	$2049.00
Compaq	Presario	1210	P150	1.4GB	16MB	14X	6.9lbs	12.1" SVGA DS	47397	$2299.00
Compaq	Presario	1610	P150 MMX	1.6GB	16MB	14X	6.9lbs	12.1" SVGA DS	47398	$2999.00
Compaq	Presario	1080	P166 MMX	1.4GB	16MB	[illegible]	7.3lbs	12.1" SVGA TFT	39697	$3999.00
Compaq	Armada	7710MT	P150 MMX	1.6GB	16MB	–	7[illegible]	12.1" SVGA TFT	47307	$4399.00
Compaq	Armada	7750MT	P166 MMX	2.1GB	32MB	–	[illegible]	12.1" XGA TFT	47309	$5799.00
Fujitsu	Lifebook	420D	P120	1.3GB	8MB	10x	7.3lbs	11.3" SVGA DS	47314	$1599.00
Fujitsu	Lifebook	531T	P133	1.3GB	16MB	10x	6.8lbs	11.3" SVGA TFT	47315	$2199.00
Fujitsu	Lifebook	535T	P133	2.0GB	16MB	10x	6.8lbs	12.1" SVGA TFT	47316	$2499.00
Fujitsu	Lifebook	535Tx	P150 MMX	2.0GB	16MB	10x	6.8lbs	12.1" SVGA TFT	47317	$3499.00
Fujitsu	Lifebook	635T	P133	1.3GB	16MB	-	4.4lbs	12.1" SVGA TFT	47318	$2999.00
Fujitsu	Lifebook	635Tx	P150 MMX	1.3GB	16MB	-	4.4lbs	12.1" SVGA TFT	47319	$3999.00
Hewlett-Packard	OmniBook	2000CS	P133	1.4GB	16MB	Opt	6.4lbs	12.1" SVGA DS	47357	$2269.00
Hewlett-Packard	Omni Book	5700CT	P150 MMX	2.0GB	16MB	Opt	6.4lbs	12.1" SVGA TFT	47352	$4379.00
Hewlett-Packard	OmniBook	800CT	P166 MMX	2.1GB	16MB	Opt	4.0lbs	10.1" SVGA TFT	47356	$4199.00
Hewlett-Packard	Omn Book	5700CTX	P166 MMX	2.0GB	32MB	Opt	6.4lbs	12.1" XGA TFT	47355	$5239.00
Hitachi	VisionBook	Plus	P133	1.4GB	16MB	10X	6.5lbs	12.1" SVGA HS	47362	$1799.00
Hitachi	VisionBook	Plus	P150 MMX	1.4GB	16MB	10X	6.5lbs	12.1" SVGA HS	47363	$2499.00
Hitachi	VisionBook	Plus	P166 MMX	1.4GB	16MB	10X	6.5lbs	12.1" SVGA TFT	47364	$3499.00
Hitachi	VisionBook	Pro	P133 MMX	1.4GB	16MB	10X	6.9lbs	12.1" SVGA TFT	47365	$3199.00
Hitachi	VisionBook	Pro	P166 MMX	2.1GB	16MB	10X	6.9lbs	12.1" SVGA TFT	47366	$4499.00
Hitachi	VisionBook	Pro	P166 MMX	3.0GB	16MB	10X	8.9lbs	13.3" XGA TFT	47367	$4999.00
Hitachi	VisionBook	Elite	P166 MMX	2.1GB	16MB	10X	5.0lbs	13.3" XGA DS	47368	$4799.00
IBM	ThinkPad	365X*	P133	1.08GB	8MB	Opt	5.9lbs	11.3" SVGA DS	36734	$999.98
IBM	ThinkPad	380	P150	1.08GB	16MB	Opt	6.6lbs	12.1" SVGA DS	44903	$1699.00
IBM	ThinkPad	380D	P150	1.35GB	16MB	8X	7.1lbs	12.1" SVGA DS	44904	$1999.00
IBM	ThinkPad	380D	P150 MMX	2.1GB	16MB	8X	6.9lbs	12.1" SVGA TFT	44905	$3279.00
IBM	ThinkPad	760E	P150	2.1GB	16MB	Opt	6.4lbs	12.1" XGA TFT	36738	$3499.00
IBM	ThinkPad	760EL	P133	2.1GB	16MB	Opt	7.0lbs	12.1" SVGA TFT	36739	$3799.00
IBM	ThinkPad	760ED	P133	2.1GB	16MB	6X	6.6lbs	12.1" XGA TFT	36737	$3699.00
IBM	ThinkPad	760XD	P166 MMX	3.0GB	32MB	10X	7.5lbs	12.1" XGA TFT	42423	$5099.00
NEC	Versa	2530	P133	1.0GB	16MB	–	6.9lbs	12.1" SVGA DS	42980	$1699.00
NEC	Versa	[illegible]	P133	1.44GB	16MB	6X	7.0lbs	12.1" XGA TFT	34173	$3999.00
NEC	Versa	[illegible]	P150	1.4GB	16MB	10X	7.3lbs	12.1" SVGA DS	42982	$2499.00
NEC	Versa	6200MX	P166 MMX	2.1GB	32MB	10X	7.5lbs	13.3" XGA TFT	42954	$5699.00
Toshiba	Tecra	500CDT**	P120	1.26GB	16MB	6X	8.0lbs	12.1" SVGA TFT	43809	$2399.00
Toshiba	Satellite Pro	440CDX	P133 MMX	1.34GB	16MB	10X	6.9lbs	12.1" SVGA HCA	44991	$2399.00
Toshiba	Satellite Pro	440CDT	P133 MMX	1.34GB	16MB	10X	6.9lbs	12.1" SVGA TFT	44990	$3299.00
Toshiba	Satellite Pro	460CDT	P166 MMX	2.0GB	32MB	10X	6.9lbs	12.1" SVGA TFT	44992	$4149.00

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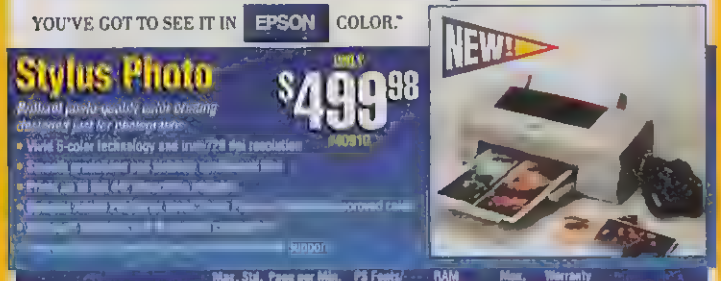

Ink Jet	Max. Std. Resolution	Page per Min. B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	Price
Lexmark Color JetPrinter 1020	600x300	3/2	–	2MB	8.5x14"	2	#31815	$149.98
Canon BJC-240	360x360	3/.27	7/300	62K	8.5x14"	1	#34188	$178.98
Canon BJC-4200	720x360	5/1	7/300	64K	8.5x14"	1	#34189	$278.98
Canon BJC-620	720x720	4/1.7	7/300	60K	8.5x14"	1	#34190	$329.98
Canon BJC-4550 Wide	720x360	5/1	7/300	64K	11x17"	1	#34191	$499.98
Canon BJC-70 Portable	720x360	4/.8	7/20	35K	8.5x14"	2	#21969	$299.98
EPSON Stylus Color 400	720x720	4/3	1	56K	8.5x44"	2	#80666	$229.98
EPSON Stylus Color 600	1400x720	6/4	5/4	56K	8.5x44"	2	#80667	$299.98
EPSON Stylus Color 800	1400x720	8/7	1	64K	8.5x44"	2	#80668	$449.00
EPSON Stylus Color 1500	720x720	3/1	5/4	256K	13.6x21.78"	2	#86318	$799.98
HP DeskJet 340 Portable	300x300	3/2-4	6/0	16K	8.5x14"	1	#27969	$279.98
HP DeskJet 672C	600x300	5/1.5	0/35	512K	8.5"x banner	1	#40979	$199.98
HP DeskJet 694C	600x600	5/1.7	8/35	512K	8.5"x banner	1	#40994	$299.98
HP DeskJet 820Cse	600x600	6.5/4	0/50	128K	8.5x14"	1	#86326	$299.98
HP DeskJet 870Cse	600x600	8/4	26/126	1MB	8.5x14"	1	#36106	$399.98
HP DeskJet 1600C	600x600	9/4	1/35	4/100MB	8.5x14"	1	#41068	$1349.00
HP OfficeJet 1150C	600x300	[illegible]	125	512K	8.5x14"	1	#40999	$999.98

Laser	Max. Std. Resolution	Page per Min. B&W/Color	PS Fonts/ TT Fonts	RAM Std./Max.	Max. Paper Size	Warranty (Years)	Item #	Price
Brother HL-720 Windows	600x600	6	0/35	512K/2MB	8.5x14"	1	#31838	$349.98
Brother HL-730 DOS/Windows	600x600	6	0/35	512K/2MB	8.5x14"	1	#34168	$399.98
HP LaserJet 6Lse	600x600	6	0/26	1/9MB	8.5x14"	1	#41022	$399.98
HP LaserJet 6MP	600x600	8	35/75	2/50MB	8.5x14"	1	#82666	$949.98
HP LaserJet 5se	600x600	12	0/110	4/66MB	8.5x14"	1	#41021	$1049.00
Okidata OP4W	600x600	4		128K	8.5x14"	1	#34167	$299.98
Okidata 16n	600x600	16	35/10	6/34MB	8.5x14"	1	#40988	$999.98
Lexmark Optra E	600x600	6	0/26	1/5MB	8.5x14"	1	#31817	$429.98
Lexmark Optra R+	1200x1200	16	39/45	4/64MB	8.5x14"	1	#36049	$1479.00
Lexmark Optra N	600x600	24	39/45	4/64MB	8.5x14"	1	#35278	$2679.00
Lexmark Optra C	600x600	12	39/45	8/64MB	11x17"	1	#87253	$5900.00

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Modems

Boca

46258 Home FaxModem 33.6 Internal $49.98*
*After $10 Mfr. Mail-in Rebate. Low Zone Price $59.98
41195 Home/Office FaxModem External 33.6 ..... $85.98*
*After $10 Mfr. Mail-in Rebate. Low Zone Price $105.98

Global Village

46325 Global Village 56K Flex Modem PC Card $208.98
46324 Global Village 56K Flex Modem/Ethernet PC Card $288.98
46257 Teleport 56K x2 External Faxmodem $154.98
46256 Teleport 56K x2 Internal Faxmodem $145.98

Supra

82558 Supra FaxModem 336 PC External $154.55
32631 SupraExpress 336e PS External $84.98
32630 SupraExpress 336i PnP Internal $64.98
46250 SupraExpress 336i SP Internal w/ASVD $90.91
32632 SupraSonic 336V+ External Voice/FaxModem $161.82

U.S. Robotics

41280 Sportster WinModem 33.6 Internal $58.88*
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41284 Sportster V.34 33.6 Ext. FaxModem $113.98*
*After $40 Mfr. Mail-in Rebate. Low Price $153.98. Expires 8/3/97
41283 Sportster V.34 33.6 Int. FaxModem $81.00*
*After $40 Mfr. Mail-in Rebate. Low Price $121.00. Expires 8/3/97
41282 Sportster Voice 33.6 Ext. FaxModem $89.98*
*After $40 Mfr. Mail-in Rebate. Low Price $129.98. Expires 8/3/97
41281 Sportster Voice 33.6 Int. FaxModem $104.27*
*After $40 Mfr. Mail-in Rebate. Low Price $144.27. Expires 8/3/97

Scanners

Artec Ultima

38414 Artec Viewstation AT6 $228.38
38456 ScanRom Pro/4E $152.22
31805 ViewStation A6000C-Plus $266.60
38933 Viewstation AT-3 $184.44

Hewlett-Packard

41029 HP ScanJet 4Cse Scanner $799.98
40973 HP ScanJet 5cse $399.98
40995 HP ScanJet 5S $249.98

Logitech

32596 PageScan Color Pro w/ADF $289.98
32597 ScanMan Color 2000 Parallel $119.29

MicroTek

25688 Page Wiz $88.89

36165 ScanMaker E3 PC Standard $179.98
36166 ScanMaker E6 Standard $359.00

Minolta

38405 Snappy 2.0 $188.83

UMAX

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45658 Astra 600S $235.56
83510 PowerLook II w/Full Photoshop $1395.00
36185 PageOffice Color Scanner $187.78

Visioneer

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43652 PaperPort MX for Windows $221.11
45653 PaperPort Strobe for Windows $272.22

Digital Cameras

Connectix

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46840 Color QuickCam & Video Phone2 v2 $225.22

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Kodak

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84968 DC20 Digital Science Camera $199.98
82413 DC25 Digital Camera $399.98
85848 DC50 Digital Camera $899.98

Olympus

37253 D-200L 2MB Digital Camera $599.98
82179 D-300L 6MB Digital Camera $899.98

Ricoh

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37216 RDC-2 Digital Camera w/Monitor $799.98
37217 RDC-2 Digital Camera w/o Monitor $649.98

Video Cards

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38734 3D Pro Turbo PC2TV 4MB PCI $172.10
38730 3D XpressionPlus 2MB PCI $94.71
38731 3D XpressionPlus 4MB PCI $101.64
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38733 3D XpressionPlus PC2TV 4MB (PCI) $184.73

Canopus

47613 Total 3D Video Card Bundle $199.00

Creative Labs

42593 Graphics Blaster 3D $89.97

Koutech Systems

38746 16-bit Sound Card PNP ISA $28.89
38745 RealMagic 64/GX MM 2MB PCI Video Card $58.89
38740 Venus ET600 128-bit Graphics Accel 2MB $83.33
38741 Venus S3d Virge 2D/3D 2MB Graphics Accelerator [illegible]

Matrox

47425 Millenium II $258.88
42343 Mystique 2MB SG RAM PCI $112.38
43909 Rainbow Runner Studio $225.57

Input

Adesso

25477 Adesso Tru-Form Ergonomic Keyboard w/o Pointer $37.65
32623 Adesso Tru-Form w/TouchPad $65.58
32624 Nu-Form w/TouchPad $56.47
25447 Tru-Form Ergonomic Keyboard w/Pointer $47.06

Kensington

44589 Expert Mouse & Web Expoxsion $99.98
40408 Kensington Mouse-in-a-Box $23.84
44549 Kensington Orbit $52.93

Key Tronic

30638 LifeTime Wireless Keyboard w/TouchPad $132.35
30637 LifeTime Wireless Keyboard w/Trackball $108.71

Logitech

32639 Logitech Cordless MouseMan Pro $70.45
31166 Logitech MouseMan '96 $43.91
25431 Logitech TrackMan Marble $35.61

Microsoft

37856 EasyBall w/Freddie Fish 1.0 $48.98
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31783 MS IntelliPoint – Combi Interface $49.88
25008 MS Natural Keyboard for Windows 95 $89.98
37830 MS SideWinder 3D Pro Joystick w/Helibender $73.98
37850 MS Sidewinder Gamepad for Windows 95 $35.96
31788 SideWinder 3D Pro $65.98

ThrustMaster

32555 ACM Game Card $29.98
39948 ThrustMaster F22 Pro Flight Control $129.41
32601 ThrustMaster FCS w/Fleet Defender $65.29
32600 ThrustMaster FormulaT2 $117.59

Wacom

23390 ArtZ II 12x12 (serial) w/Erasing UltraPen $431.99
23388 Wacom ArtPad II (serial) w/Dabbler Bundle $151.99
23387 Wacom ArtPad II (serial) w/UltraPen $137.93

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Altec

82560 ACS-55 Gamma Audio System $149.98

82559 ACS-45 ..... $78.88

Bose

31821 AcoustiMass Multimedia Powered Speakers $599.98
31822 MediaMate Shielded Multimedia Speakers $169.98

Sony

86839 SRS-300D Speakers w/Sub $169.98
86838 SRS-91 Speakers $135.98
32804 SRS-PC21 Speakers $24.98
32805 SRS-PC41 Speakers $54.98

Yamaha

83857 YST M7 Speaker – 10w $40.00
87498 YST-M15 Powered Speakers $68.75

Mass Storage

Iomega

32073 Ditto 3200 Parallel Port $279.95
26169 Ditto Easy 800MB External Parallel Port Tape Drive $109.95
25659 Jaz 1GB External Drive $399.95

25658 Jaz 1GB SCSI Insider Drive $289.95
22339 Zip 100 Parallel Port $149.95
91825 Zip 100 SCSI $149.95

Promise Technology

[illegible] $48.60
[illegible] $48.60
27525 EIDE 4030 Plus Disk Accelerator for VLB $118.29
27524 EIDE Max Disk Controller $22.70

Synnex

36320 Universal PC Hard Drive Mounting Kit $2.30

SyQuest

36341 SyJet 1.5GB Enhanced Parallel Drive $528.98
36328 SyJet 1.5GB Internal IDE Drive $398.98
[illegible] $199.98

CD-ROM Drives

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46835 PC-DVD $479.98
45556 Sound Blaster AWE64 Gold 4MB $184.02
47557 Sound Blaster AWE64 Value $92.01
47526 Sound Blaster Discovery AWE64/2400 $248.44
47524 Sound Blaster Performance AWE64 Gold $322.06
47525 Sound Blaster Valve AWE64/1800 ..... $220.83

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43137 Mitsumi 6X ATAPI Internal CD-ROM Drive $75.00

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38702 NewCom 12X Internet Multimedia Kit .. $157.95
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38709 NewCom 8X Internet Multimedia Game Kit .. $159.09

Philips

38711 Philips CDD2600/20 External CD Recorder .. $771.35

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43138 Sanyo 20X ATAPI Internal CD-ROM Drive .. $135.23

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40982 DiscMan 6X CD-ROM PRD-650 .. $349.98
47535 Sony 12X SCSI 2 Internal CD-ROM Drive .. $136.36
47534 Sony 16X ATAPI Internal CD-ROM Drive .. $95.45

Media

Iomega

36337 Ditto 2GB Tape Cartridge 3-Pack .. $59.95
36336 Ditto 2GB Tape Cartridge Single .. $19.98
34701 Ditto 3200 Cartridge Single .. $49.95

83370 Jaz Media 1GB Pre-Formatted .. $124.95

22336 Zip Media PC100 10-Pack .. $149.95
22337 Zip Media PC100 3-Pack .. $49.95
26184 Zip Zoom SCSI Accelerator .. $49.95

Kodak

83580 CD-R 74-min Media .. $5.89

Nomai

39173 CD-R 74-min Media .. $4.98

Panasonic

87561 PowerDrive 2 650MB PD Media .. $44.98

Performantz

40359 SyQuest Compatible EZ135MB Cartridge .. $14.98

Philips

89805 CD-R 74-min Cartridge .. $4.89

Sony

14368 Sony CD-R 650MB (74-min) .. $5.00
14358 Sony DG90M 4mm Data Cart 2GB .. $6.34
14397 Sony QD6525 1/4" Data Cartridge 525MB .. $20.06

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33325 EZFlyer 230 Cartridge 10-Pack .. $238.95
33322 EZFlyer 230 Cartridge 5-Pack .. $124.95
34705 EZFlyer 230 Cartridge Single .. $29.98
33318 EZFlyer 230 PC Cartridge 3-Pack .. $79.98
36330 SyJet Cartridge 3-Pack .. $319.98
36331 SyJet Cartridge 5-Pack .. $519.98
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VeriSlim

17895 4mm DL 90m 2.0GB Tape .. $8.02

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40380 PowerLeap PL-586 Processor Upgr. $89.98

Evergreen Technology

30349 Evergreen 586/133 .. $100.57

Intel

32015 Intel Pentium Overdrive 120/133MHz for P60/66 .. $186.43
32016 Intel Pentium Overdrive 120/133MHz P75 .. $352.52
32018 Intel Pentium Overdrive 166MHz for P100 .. $405.63
28155 Intel Pentium Overdrive 63MHz .. $135.16
28615 Intel Pentium Overdrive 83MHz .. $186.43
46812 Intel Pentium Overdrive MMX150 .. $318.63

PowerLeap

40381 PL386 Upgrades 386DX to 486SX 50/66 MHz .. $92.39
40380 PL586 Upgrades 486SX/DX/DX2 .. $92.39

Surge/Back-Up

American Power

94359 APC Back-UPS 200 .. $87.53
05901 APC Back-UPS 450 .. $171.52
11651 APC Back UPS 600 .. $256.10
[illegible] APC Back-UPS Pro 1000 .. $376.17
91900 APC Back-UPS Pro 420 PnP .. $236.68

94395 Personal Surge Arrest 7-Outlet w/Phone $14.98

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94393 APC Prof Surge Arrest 7-Outlet w/Phone .. $31.92
95364 Back-UPS 400 .. $139.98
26812 Back-UPS 650 Pro PnP .. $287.31
85595 Back-UPS Office .. $139.98*
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83574 Back-UPS Pro 280 PnP .. $143.54

Optiquest

34526 OPTI-UPS 280 PnP .. $96.09
34527 OPTI-UPS 420 PnP .. $144.13
25890 OPTI-UPS 650E .. $220.11
34522 OPTI-UPS 1400 .. $411.17

Mobile-Windows CE

Casio

42937 Cassiopeia A10 w/2MB RAM .. $499.98
41732 Cassiopeia A11 w/4MB RAM .. $499.98

Compaq

42915 PC Companion C120 .. $399.98
42916 PC Companion C120+ .. $499.98

Philips

42941 Velo 1 Handheld PC .. $799.98
45833 ACTI for CE .. $88.98

Mobile-Combo Modem/Network

Megahertz

41248 XJACK 33.6 & Ether Combo 10T/10Z PC Card .. $334.98
41189 XJACK 33.6 & Ether Combo PC Card 10T .. $314.98
44262 XJACK 33.6 PC Card Modem .. $209.98

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44261 XJACK 56 Kbps PC Card Modem .. $229.98

Mobile-Network Cards

Megahertz

44283 Sportster 33.6 PC Card for Windows & DOS .. $198.98
24846 XJ 10BC PCMCIA XJACK 10T/BNC .. $129.98
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39617 XJACK 33.6 PC Card Modem Cell Capable .. $239.98
44261 XJACK 56K PC Card Modem .. $229.98

Mobile-PDAs

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44255 PalmPilot Personal .. $270.98

80599 NowSynchronize for PalmPilot .. $33.98
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30804 SCSI 600 PC Card .. $72.52
30809 Serial PC Card Adapter .. $66.48

New Media

39622 Basics SCSI (DB-25) PCMCIA Adapter .. $87.21

Socket Communications

19936 I/O PCMCIA Serial Adapter .. $135.37
34594 Infrared Serial Adapter .. $159.98

Mobile-Portable CD-ROMs

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35350 Portable 4X4 CD-ROM Changer .. $363.84

Fujitsu

36258 EdgerMedia 6X CD-ROM w/PCMCIA Adapter .. $318.18

Microsolutions

35366 Backpack PD/CD-ROM Drive .. $417.05
31079 Backpack Plug and Play 4X CD-ROM Drive .. $183.18
31690 Backpack Plug and Play 4X CD-ROM Drive w/Sound .. $257.85
35363 Backpack Plug and Play 8X CD-ROM Drive .. $251.14
35352 Backpack Plug and Play 8X CD-ROM Drive w/Sound .. $321.59

Mobile-Multimedia Cards

AIMS Lab

40400 Grabit Video Capture .. $119.32

AITech

30634 Pocket Scan Converter .. $96.70

New Media

39624 Basics GAMEport .. $56.82
30315 Gamejammer PCMCIA .. $170.45
35105 Laptalk Stereo Speakers .. $45.45
26023 WAVJammer 16-bit PCMCIA Sound Stereo .. $204.55

Mobile-Hard Drives

Simple Technology

39153 1.08GB for IBM ThinkPad 355, 360, 750 .. $453.41
37770 1.3GB for IBM ThinkPad 355, 360, 751 .. $507.95
37773 2.1GB for IBM ThinkPad 355, 360, 752 .. $622.73

Mobile-Cases

Targus

91934 Targus Leather Case with CPU Purchase Promo .. $69.98
06810 Targus Leather NoteBook Case – Black .. $88.23
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11910 QuarkXPress 3.32 .. $588.98

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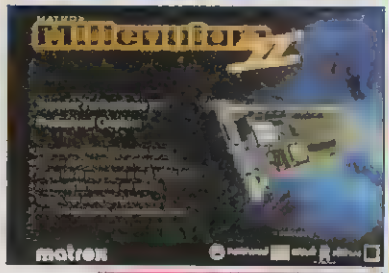

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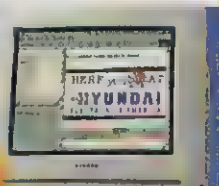

14" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
Hyundai DeluxScan 14S	13.2"	1024x768	0.28	50-100	VESA DPMS	#83278	$149.98
KDS 1450 Reconditioned	13.2"	1280x1024	0.28	50-90	VESA DPMS	#39130	$169.98
NEC MultiSync C400	13.2"	1280x1024	0.28	50-118	MPR II/Nutek	#27642	$295.98
Performantz 1400	13.2"	1024x768	0.28	50-120	VESA DPMS	#45559	$169.98

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Hyundai DeluxScan 15B	13.7"	1024x768	0.28	50-127	VESA DPMS	#37271	$229.98
KDS 1500 Reconditioned	13.8"	1280x1024	0.28	60-82	OSD/DPMS	#39137	$199.98
MAG InnoVision DJ-530	13.8"	1280x1024	0.28	50-120	MPR II/Jag Control OSD	#38737	$319.98
NEC MultiSync C500	13.8"	1280x1024	0.28	50-120	MPR II/Nutek	#86328	$389.98
NEC MultiSync M500	13.8"	1280x1024	0.25	55-120	Speakers, MPR II/Nutek	#86792	$379.98
Performantz 1500	13.7"	1280x1024	0.28	50-110	EPA/VESA	#45605	$229.98
Princeton EO50	13.8"	1280x1024	0.28	40-120	FCC/MPR II	#35144	$285.98
Sony MultiScan 100sx	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82686	$369.98
Sony MultiScan 100sf	13.9"	1024x768	0.25	50-120	EPA/MPR II/Nutek	#82687	$419.98
ViewSonic 15GA PerfectSound	14"	1280x1024	0.27	50-160	Speakers, FCC/MPR II	#23484	$389.98

17" Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
MAG InnoVision DJ-700	16.0"	1280x1024	0.25	50-110	MPR II/PnP	#38736	$549.98
NEC MultiSync M700	15.6"	1280x1024	0.25	60-120	Speakers, MPR II/Nutek	#86793	$769.98
[illegible]	15.6"	1600x1200	0.25	55-160	MPR II/Nutek	#39138	$899.98
Performantz 1700 Color	15.75"	1280x1024	0.28	50-120	EPA/MPR II	#47560	$449.98
Princeton 74T	16.1"	1280x1024	0.25	50-120	FCC/ISO 9001	[illegible]	$539.98
Princeton 76T	16.1"	1600x1200	0.25	50-120	FCC/ISO 9001	#38739	$759.98
Sony MultiScan 200sf	15.9"	1280x1024	0.25	50-120	EPA/MPR II/Nutek	#06687	$759.98
Sony MultiScan 200sx	15.9"	1280x1024	0.25	50-150	EPA/MPR II/Nutek	#06689	$699.98
ViewSonic 17EA Multimedia	16"	1280x1024	0.28	50-120	Speakers, FCC/MPR II	#28000	$579.98
ViewSonic 17GS	16"	1280x1024	0.27	50-160	FCC/MPR II	#23486	$599.98
ViewSonic GT770 SonicTron	15.9"	1280x1024	0.25	50-120	FCC/MPR II	#87296	$879.98
ViewSonic 17GA PerfectSound	16"	1280x1024	0.27	50-160	Speakers, FCC/MPR II	#23483	$849.98
ViewSonic 17PS	16"	1600x1280	0.25	50-160	FCC/MPR II	#26526	$749.98
ViewSonic PT775 SonicTron	16"	1600x1280	0.25	50-160	FCC/MPR II	#82696	$799.98

20"+ Monitors	Viewable Area	Maximum Resolution	Dot Pitch/ Aperture Grille	Vertical Scan Rate	Features/ Safety	Item #	ONLY
NEC MultiSync E1150	19.8"	1600x1200	0.28	55-120	MPR II/Nutek	#86669	$1459.00
NEC MultiSync P1150	19.6"	1600x1200	0.25	55-160	MPR II/Nutek	#39139	$1569.00
Optiquest Q100	18.4"	1600x1280	0.28	69-106	MPR II/PnP	#40998	$999.98
Sony MultiScan 300sf	19.1"	1280x1024	0.25	48-150	EPA/MPR II/Nutek	#82688	$1599.00
Sony MultiScan 900w	22.5"	1920x1200	0.25	50-160	EPA/MPR II/Nutek	#80665	$4899.00
ViewSonic G800	18.4"	1600x1200	0.28	50-120	FCC/MPR II	#40971	$1086.00
ViewSonic GT800 SonicTron	19.1"	1600x1280	0.3	48-150	FCC/MPR II	#87295	$1249.00
ViewSonic P815	20"	1800x1440	0.25	[illegible]	FCC/MPR II	#84170	$1599.00
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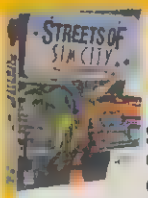

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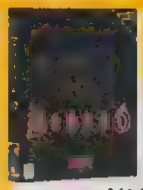

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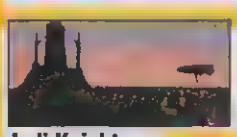

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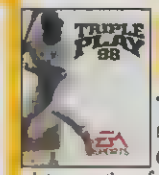

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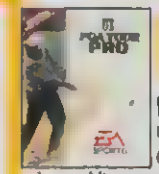

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Product Information Number 121

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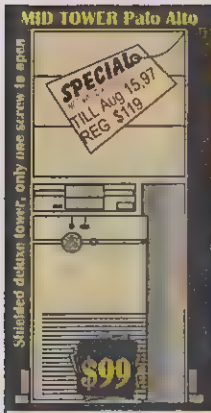

BAREBONE SYSTEMS

Basic System includes:DFI Intel Triton/VX-II Main Board,PnP Flash BIOS 256K PLB Cache,1.44 Floppy Drive,Fast I/O,4xHD E-IDE,FDC,Mini Tower 235W PSU,Heatsink & Fan (MID TOWER Upgrade $20,512KCache+$10)

Without CPU only.....$129	VX-II	430VX	430TX
AMD K6 166Mhz MMX	299	319	349
AMD K6 200Mhz MMX	359	379	399
AMD K6 233Mhz MMX	549	569	599
Pentium 166Mhz MMX	339	359	379
Pentium 200Mhz MMX	399	419	449
Pentium 233Mhz MMX	549	569	599
Cx6x86 PR166 MX	299	319	349
Cx6x86 PR200 MX	359	379	399
Cx6x86 PR233 MX	499	519	549
Cx6x86 P200+ (VLSI/SIS)			249
PENTIUM -II 233/266Mhz ATX			899/1099
Pentium Pro 150/200Mhz 440FX			379/629

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- MITSUMI PS/2 MOUSE & HARD TOP PAD

WIN 95 SR2 preinstalled disk &manuals

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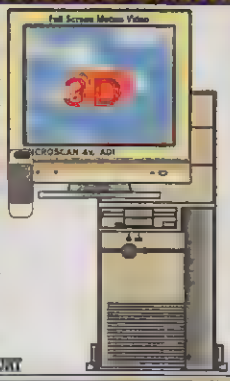

Cx6x86 P200+	1,249
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Cx M2 233	1,499
AMD K6 166MMX	1,349
AMD K6 200 MMX	1,409
AMD K6 233MMX	1,559
Pentium 166MMX	1,369
Pentium 200MMX	1,439
Pentium 233MMX	1,589
Pentium Pro200	1,599
Pentium II 233	1,849
Pentium II 266	2,049

DISPLAY ADAPTERS

TRIDENT 9680 1Mb EDO (made in USA)....39
TSENG LABS 128bit 2Mb (made in USA)..65
DIAMOND 3D 2000 4Mb EDO.....89
DIAMOND 3D 3000 2Mb VRAM....119
DIAMOND MONSTER 3D 4Mb EDO 149
MATROX MILLENIUM-II 4Mb WRAM.199
HERCULS STINGRAY 128/3D 6Mb 219

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17" Samsung GLsi 26mm.....699

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SEAGATE 3.2Gb MEDALIST 12ms...229
QUANTUM 3.2Gb UDMA-33 10ms...229
SEAGATE 6.3Gb ATA-3 10ms 5400..399
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CPU/RAM

MMX —— CPU's	
P166/200....199/249	Pentium 133....99
K6-166/200,179/229	Pentium 150....129
CxM2 200/233..229	Pentium 166...149
8,16,32 EDO....$Call	Pentium 200....199
SDRAM.....$Call	Cyrix P166+.....89
	Cyrix P200+...99

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ESS/OPTI 3D PnP Full Dplx 16bit.....29
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Sound Blaster AWE64 Gold.....199

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Diamond Supra Express 33.6i voice...69
DIAMOND SUPRA 56K.....119
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Pentium 233 MMX	529		549	549
AMD K6 200 MMX enhanced	335		355	355
AMD K6 233 MMX enhanced	429		449	449
Cyrix M2 166 MX	265		289	289
Cyrix M2 200 MX	335		355	355
Cyrix M2 233 MX	439		459	459
Cyrix 6x86 P200+				209
Pentium II 233/266Mhz ATX				849/999
Pentium Pro 150/200Mhz				329/599

Giga-Byte GA586HX Intel Triton 430HX 512K Cache 6X SIMMs

5586HX as shown

	430TX	430HX	SIS...	SIS550Z
AMD K6 166Mhz MMX	329	309	299	309
AMD K6 200Mhz MMX	399	379	369	379
AMD K6 233Mhz MMX	599			589
Pentium 166Mhz MMX	359	339	329	339
Pentium 200Mhz MMX	429	409	399	409
Cyrix M2 PR166 MX	329		299	309
Cyrix M2 PR200 MX	399		369	379
Cyrix M2 PR233 MX	549		519	529
Cyrix 6x86 P200+ (GA586S)			199	219
Pentium Pro 150/200				349/649

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Product Information Number 123

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DIGITAL	PACKARD BELL	and many more!

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MATROX
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Millenium II 3D (4MB)
Millenium II 2MB Memory Upgrade
Millenium II 4MB Memory Upgrade
Millenium II 8 MB Memory Upgrade
Millenium II 12 MB Memory Upgrade
Mystique (2MB)
Mystique (4MB)
Mystique 2MB Memory Upgrade
Mystique 4MB Memory Upgrade
Mystique 6MB Memory Upgrade
Rainbow Runner Studio Upgrade
Rainbow Runner TV Upgrade

VIDEOLOGIC
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Apocalypse 5D (2MB) rev2
Apocalypse 5D (4MB) rev2
GrafixStar 500 (4MB)
GrafixStar 70 (4MB)
GrafixStar 600 (2MB)
GrafixStar 550 (2MB)
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3D Blaster VLB Version
Graphics Blaster (4MB)
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Sound Blaster AWE64 PnP
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Pentium II 233 MHz.	$639	K-6 200 MHz. MMX	$255
Pentium Pro 200 MHz.	$509	K-6 166 MHz. MMX	$199
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16 megs 4x32-60 Non Parity	$ 64	SDram 32 megs	$143
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ASUS TX 97-E, Triton 4, 4 PCI, 4 ISA $169

Super Micro P5 MMS, Triton 4, 4 PCI, 4 ISA $159

Tyan S1570 TX, Triton 4, 5 PCI, 4 ISA $152

P-5 Intel Triton 3 VX, 4 PCI, 3 ISA $75

P5 M.B.'s can use Intel P5, AMD K5 & K6, and Cyrix CPU's

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Super Micro SNE $253
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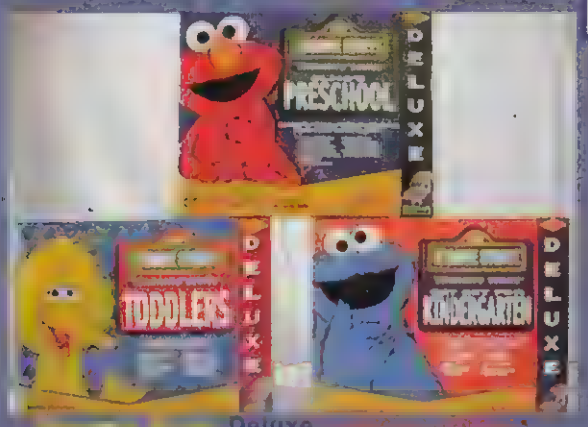

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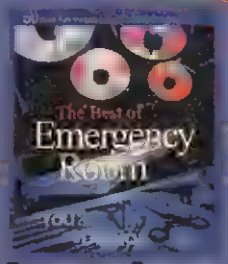

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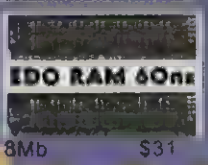

8Mb	$31
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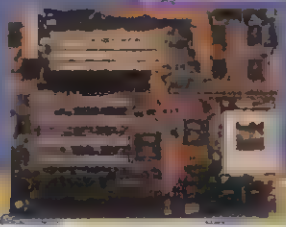
32Mb	$106



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Product Information Number 278

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DVD ROM

233 MMX

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- 64MB EDO 60ns Memory
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- Toshiba 24X Max EIDE CD-ROM Drive
- Creative Labs Sound Blaster AWE64 Value Edition Wavetable Stereo Sound Card
- USRobotics 56K Internal Fax/Modem w/ Voice Mail
- ATX Full Tower Case w/Dual Fans
- 104-key Keyboard & Microsoft Mouse
- Yamaha M15 Active-Servo Amplified Stereo Speakers
- Microsoft Windows NT 4.0 Workstation CD
- USB Ready
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- Monitor Not Included

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Pentium II-266 MHz	$2699	$88/mo.

AMD

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- Quantum Fireball ST 6.4GB UltraDMA IDE Hard Drive, 10ms
- Matrox Mystique 64-Bit PCI SVGA 3D & MPEG Graphics Accelerator w/4MB SGRAM
- Toshiba 24X Max EIDE CD-ROM Drive
- Creative Labs Sound Blaster AWE64 Value Edition Wavetable Stereo Sound Card
- USRobotics Sportster 33.6 Fax/Modem w/Voice Mail Upgradable to X2 56K Technology
- ATX Mid Tower Case w/ Dual Fans
- 104-key Keyboard & Microsoft Mouse
- Yamaha M15 Active-Servo Amplified Stereo Speakers
- Microsoft Windows 95 CD Release 2
- USB Ready
- 3 Year Labor/2 Year Parts Limited Warranty w/1 Year On Site Service
- Monitor Not Included

Pentium-166 MMX	$1799	$58/mo.
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Pentium-233 MMX	$1999	$65/mo.

Intel Pro Desktop

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- 32MB EDO 60ns Memory
- Intel 440FX PCI Chipset
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- Toshiba 24X Max EIDE CD-ROM Drive
- Creative Labs Sound Blaster 32 Wavetable Stereo Sound Card
- USRobotics Sportster 33.6 Fax/Modem, Upgradable to X2 56K Technology
- ATX Mid Tower Case w/Dual Fans
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- Yamaha M7 Active-Servo Amplified Stereo Speakers
- Microsoft Windows NT 4.0 Workstation CD
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Pentium Pro-180	$1799	$60/mo.
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- Toshiba 24X Max EIDE CD-ROM Drive
- Creative Labs Sound Blaster 32 Wavetable Stereo Sound Card
- USRobotics Sportster 33.6 Fax/Modem, Upgradable to X2 56K Technology
- Mid Tower Case w/ Dual Fans
- 104-key Keyboard & Microsoft Mouse
- Yamaha M7 Active-Servo Amplified Stereo Speakers
- Microsoft Windows 95 CD Release 2
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- Monitor Not Included

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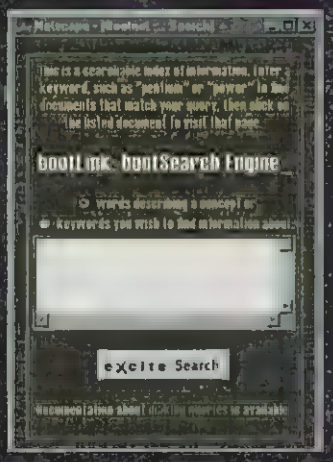

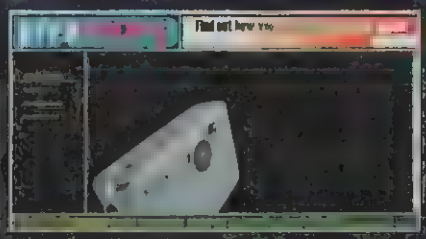

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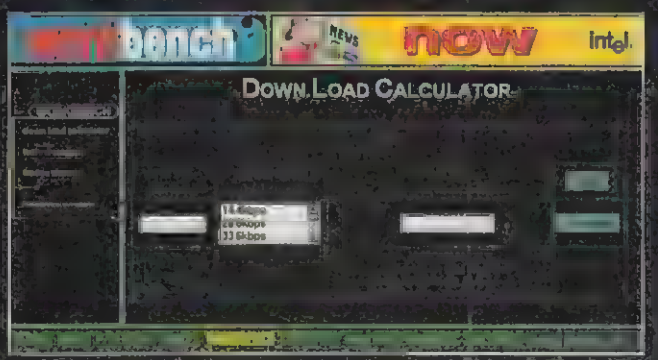

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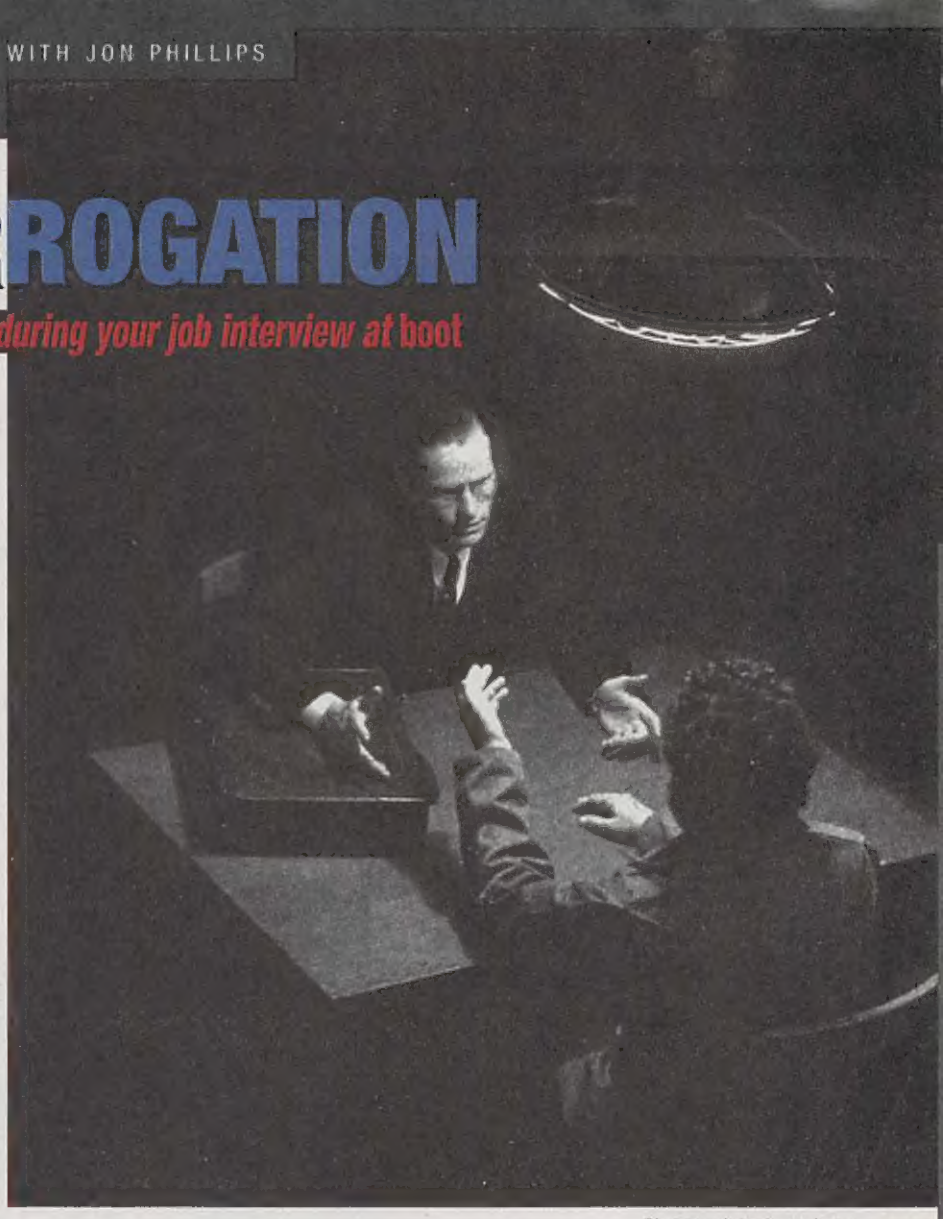
GLITCH

THE INTERROGATION

You better have the right answers during your job interview at boot



Photograph by Aaron Lauer

"Thank you for coming, Mr. Brown. I have a noon appointment with the local safety inspectors, so let's get down to brass tacks. What kind of material are you?"

"I'm *boot* material, sir."

"And what makes you *boot* material, Mr. Brown?"

"My PC obsession."

"And as you wrestle with your PC obsession, what is there never enough of."

"There is never enough processor power."

"And what is there way too much of?"

"There's way too much crap in today's consumer systems."

"Define 'crap,' Mr. Brown."

"FM Synth is crap."

"Is there any other way to describe FM Synth?"

"There are many ways to describe FM Synth—but it's preferable to constantly use the same term. That way the reader knows you have so little regard for FM Synth, you won't even grant it more than one put-down."

"And what in a system might 'poop out,' Mr. Brown?"

"The processor—if you overclock it without sufficient cooling."

"Is this a bad thing?"

"No. I like to watch the fire."

"Electrical fire, yes. Always an exciting event. Poop outs aside, what in a system might 'take a dump'?"

"Windows 95."

"Under what circumstances?"

"Any and all circumstances. Windows 95 takes dumps on the slightest provocation. The system is regular."

"Tell me, Mr. Brown, what coughs?"

"A system coughs."

"In what direction does it cough?"

"It coughs up."

"And what does a system cough up?"

"Scores. Benchmarking scores."

"Coughs up scores like an old man coughing up phlegm, or coughs up scores like an oyster coughing up a precious pearl?"

"Depends on the scores. Frame rates of less than 30fps resemble phlegm. Frame rates approaching 60fps are much more attractive."

"You obviously have a discerning eye. What's your 3D accelerator of choice?"

"It exists only in my imagination, sir."

"Good man, Brown. Tell me, if your dream 3D card did exist, what might it pump?"

"Why, pixels of course."

"And might these pixels also be pushed?"

"By all means, 3D cards are both pixel pushers and pixel pumpers—and they're also capable of powerful pyrotechnics."

"Well, that's what we've always thought. OK, Mr. Brown, we're running long, so let's discuss personal requirements. For whom is a $12,000 annual salary enough?

"It's enough for me—if I can spend my days and nights playing with the latest PC hardware."

"And who won't complain when he discovers all his co-workers make much more money than him?"

"I won't complain—because I'm willing to do anything to be the first on my block with AGP hardware."

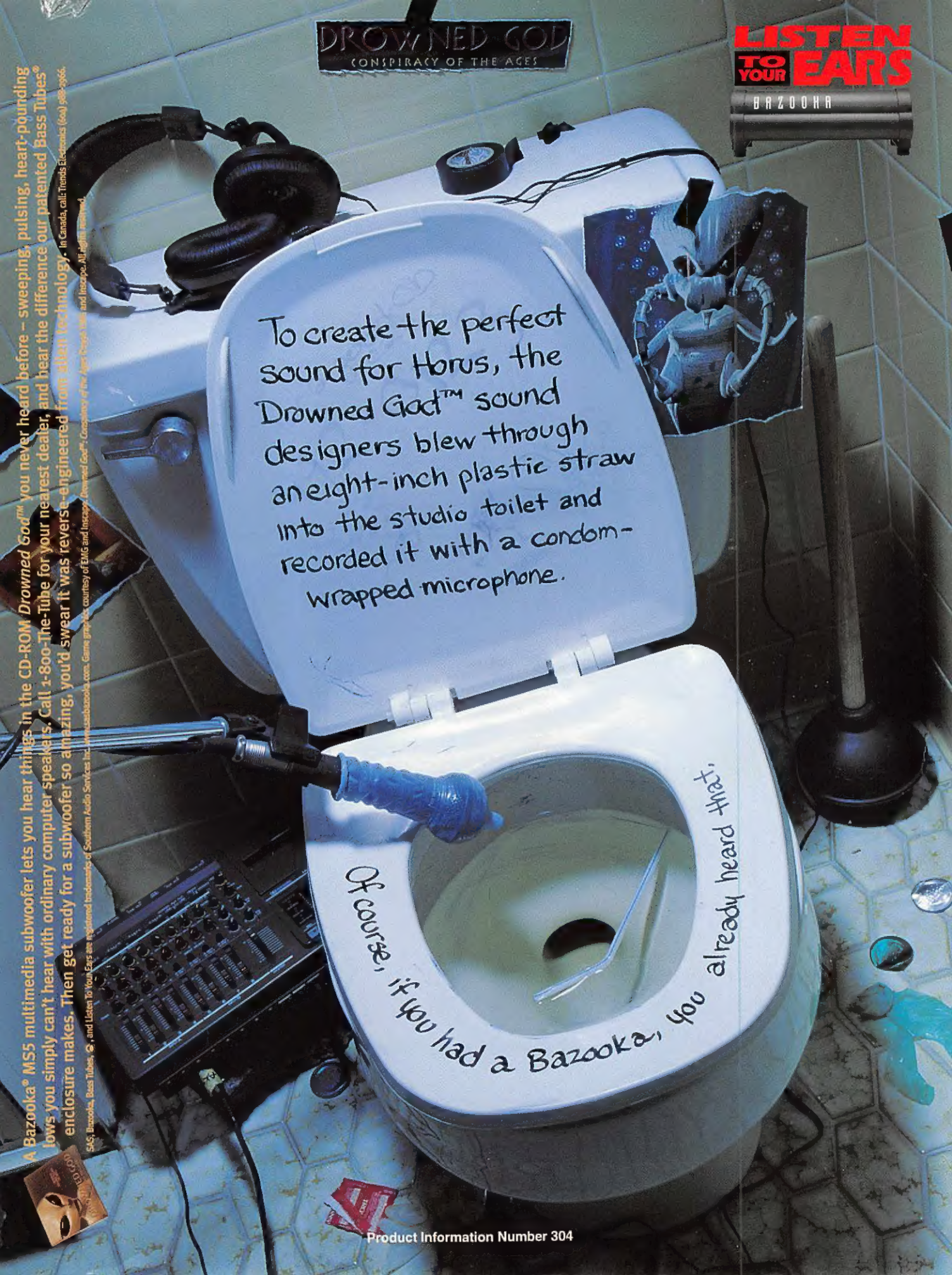
"You do understand, Mr. Brown, that you're not allowed to take review units home?"

"Who says I'm ever going home?"

"Fair enough. One last question, Mr. Brown: What day will be a joyous occasion?"

"The day when Matrox and S3 begin shipping true 3D accelerators. It will come. It has to come."

"We sincerely hope so too, Mr. Brown. Welcome to *boot* magazine." b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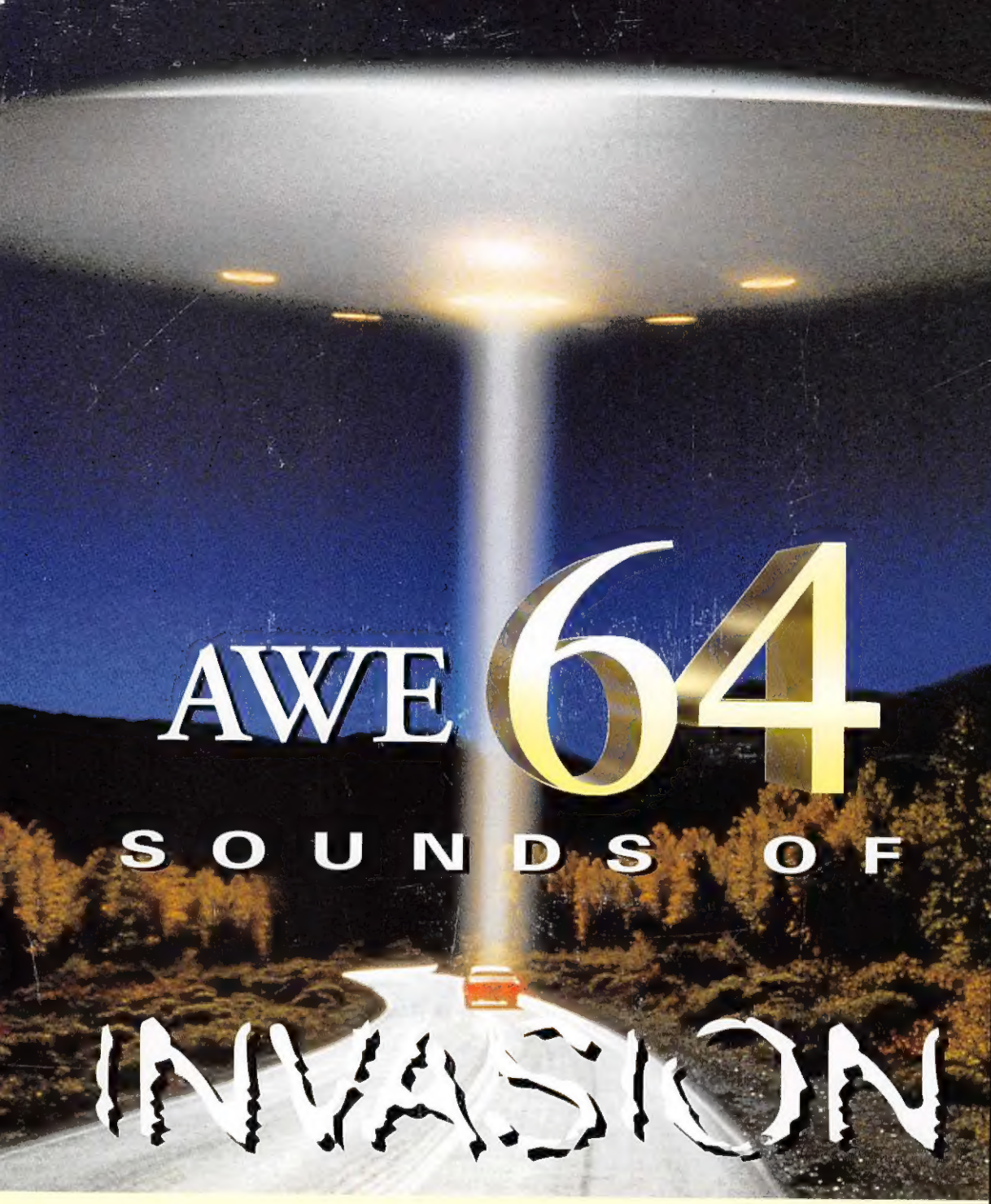

1. "We Come In Peace."
2. Blasting Ray Guns.
3. People Screaming.
4. "You Must Believe Me!"
5. Exploding Buildings.
6. Whirring Space Ships.
7. Brains Being Sucked.
8. Bones Crunching.
9. Aliens Phoning Home.
10. Metallic Scraping.
11. Cars Crashing.
12. Kidneys Bursting.
13. Insertion of Probes.
14. Heads Exploding.
15. "Run for Cover!"
16. "Warning."
17. Aliens Melting.
18. Pods Hatching.
19. Destroying the Monster.
20. Buildings Imploding.
21. Spaceships Docking.
22. Boiling Flesh.
23. "Mayday, Mayday!"
24. Exploding Spaceship.
25. People Running.
26. "I saw a UFO!"
27. Planes Taking Off.
28. "We're at DefCon 4."
29. Aliens Communicating.
30. Children Crying.
31. Slurp.
32. Clinking of Autopsy Instruments.
33. Laser Swords Crashing.
34. "Hyperspace!"
35. Flesh Being Torn Off Bones.
36. "They're Coming."
37. Wailing Sirens.
38. "You Must Die."
39. "Beam Me Up."
40. Zap!!!
41. Air Locks Closing.
42. "Oh, My God!"
43. Lasers Charging Up.
44. "We Need More Power!"
45. Ray Guns Blasting.
46. Calling the Mothership.
47. Horns Blaring.
48. "We Won!"
49. "Lock on Target!"
50. Crystals Charging.
51. Area 51 Guard: "No Admittance."
52. Zap-Zap!
53. Warning Alarms.
54. Air Locks Opening.
55. "Set to Stun!"
56. "Red Alert!"
57. Shields Up.
58. Warp Speed.
59. "Blast 'em!"
60. Eyeballs Squishing.
61. Spaceships Cloaking.
62. Radar Ping.
63. "Fire at Will!"
64. "Take Me to Your Leader."

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